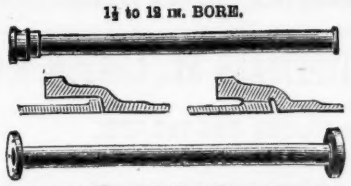
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXI. No. 1564.] LONDON, MAY 2, 1893. [45TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S

TORBAY PAINTS

Special Quotations to Gas Companies.

DARTMOUTH, DEVON.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes

4 cubic feet per hour.

Gives a light of

70 to 80 candle power.

Brilliant Light.

Perfectly Steady and

Noiseless.

Smokeless.

Reduced Heat.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Prices and particulars on application to

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,

14, PALMER STREET, WESTMINSTER, LONDON.

(Near St. James's Park Station.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS.

SPECIALITY: PATENT CASH PREPAYMENT METERS.

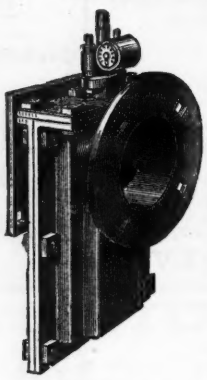
S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

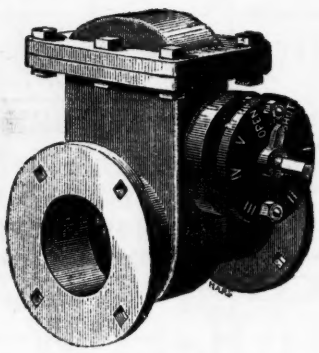
MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

REDUCED IN PRICE.

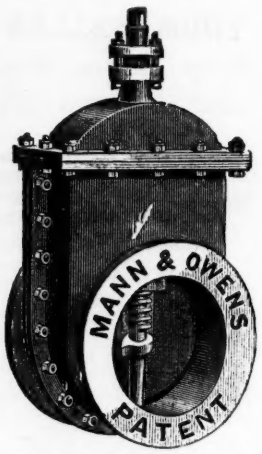
VALVE to OPEN DOWNWARDS



BRIDGE VALVE
for Regulating the Seal
of Hydraulic Mains.



FULL-WAY RACK AND
PINION VALVE.



VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-Truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

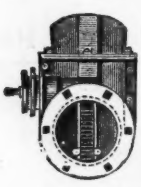
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS, of all Sizes.

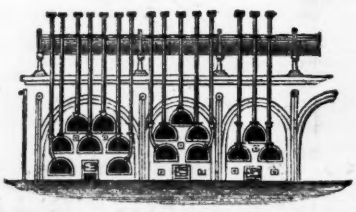
GASHOLDERS,
AND
Gasholder Tanks.

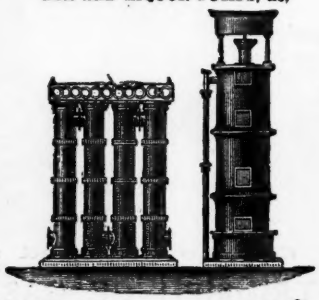
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates
and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

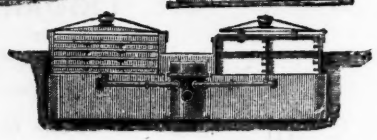
PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.







PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

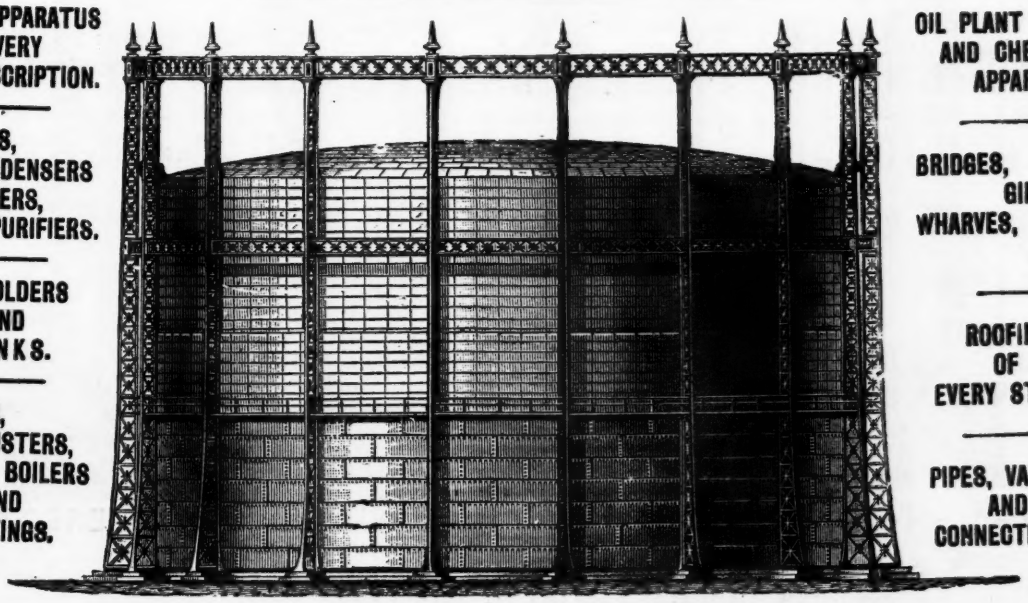
Telegrams: "GASOMETER GLASGOW." GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

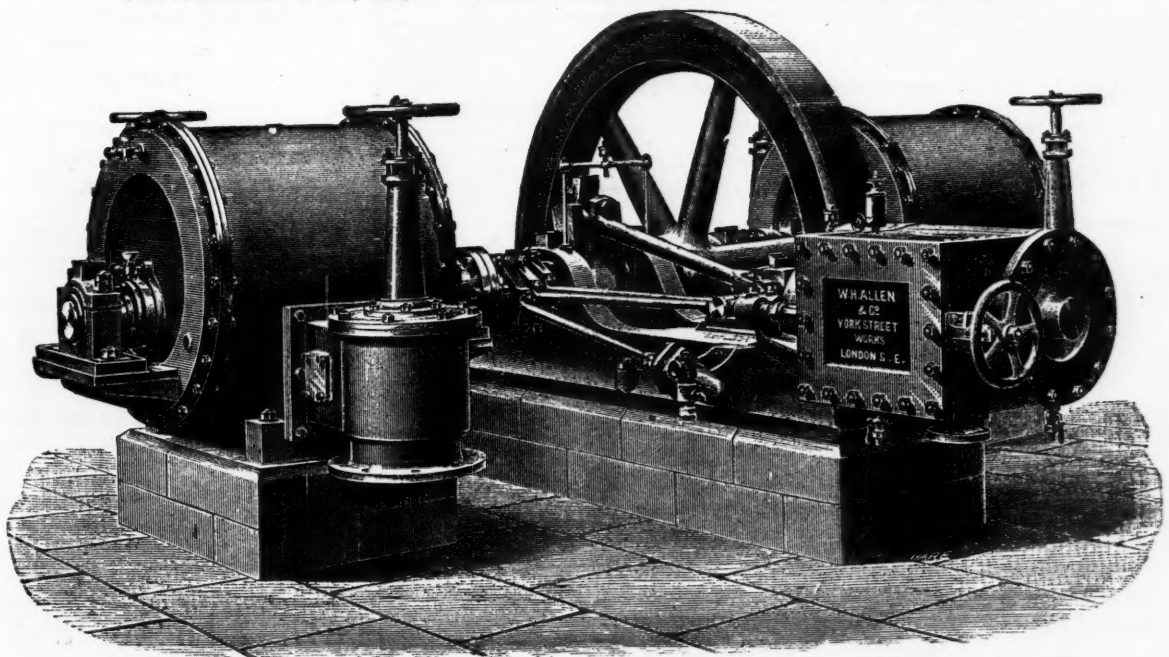
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

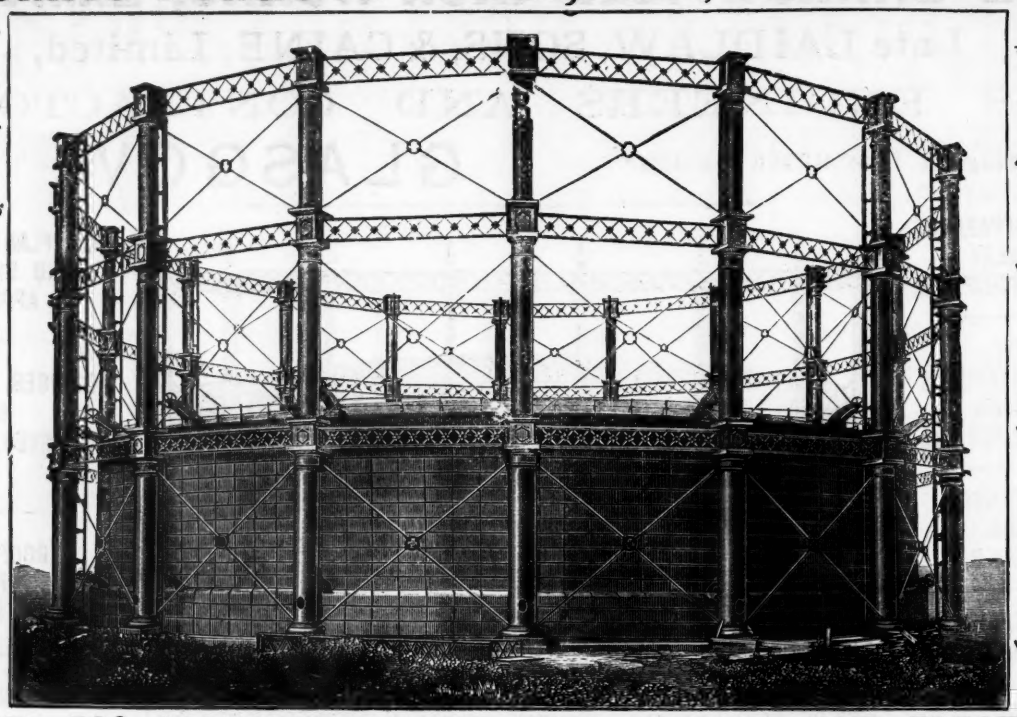


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS. BOILERS, ENGINES, PUMPS, ROOFS RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

(Mr. JOHN WEST, M.Inst.C.E., *Managing Director*),

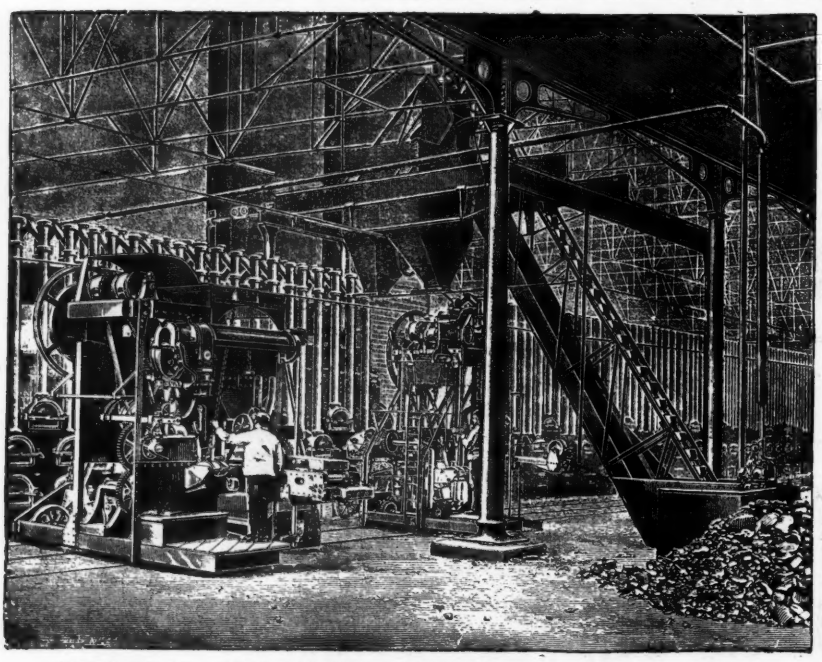
Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY.

COKE BREAKING, CONVEYING, AND WASHING MACHINERY.

OXIDE ELEVATING MACHINERY.

COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES WITH SELF-SEALING LIDS, FITTED WITH

KING'S PATENT FASTENINGS.

N.B.—The whole of these Fittings are made of Wrought Iron.

THE CHARLES HUNT GAS WASHER

(HUNT'S PATENT).

By this Washer, which performs the functions of both a Washer and Scrubber, any tarry matters are intercepted, and the whole of the Ammonia is removed from the Gas, together with a high percentage of Carbonic Acid and Sulphuretted Hydrogen.

This is effected by causing the Gas to pass in finely-divided streams through a series of light seals, formed by inverted troughs, having their perforated sides submerged in liquid, and placed one above another. Clean Water, being introduced at the top and flowing from tier to tier in the opposite direction to the Gas, leaves the Washer at the bottom as strong Ammoniacal Liquor.

The lower tiers perform the function of a most efficient Tar Extractor, removing from the Gas all traces of tarry matters.

The total back pressure due to this apparatus does not exceed about 7 ins.

The advantages claimed for the Washer are: **It is entirely automatic in action**, depending only upon a constant supply of clean water, proportionate in quantity to the volume of Gas passing. **It has no moving parts**, and thus **no driving machinery or power** is required other than a slight extra duty thrown on the Exhauster. **It is economical in first cost**; there is **practically no wear and tear**; and consequently **no expense for maintenance**. It is **compact in form, occupies little space, and requires no heavy foundations.**

For prices and particulars apply, stating capacity required, to the Sole Makers, Messrs. S. CUTLER & SONS.

GAS CONDENSERS

MORRIS & CUTLER'S PATENT CONDENSER

IS IN USE AT OVER 80 GAS-WORKS.

It is Independent of Atmospheric Temperature,
Prevents the Formation of Naphthaline,
Is Readily Adjusted to Condense varying makes of Gas,
Acts as a Frictional Tar-Separator,
Efficient, Compact, Convenient, Ornamental.

Sole Makers, Messrs. S. CUTLER & SONS.

GASHOLDERS of EVERY SIZE and TYPE.

SAML. CUTLER & SONS, MILLWALL, LONDON.

Westminster Office: 16, GT. GEORGE STREET.

GASHOLDERS

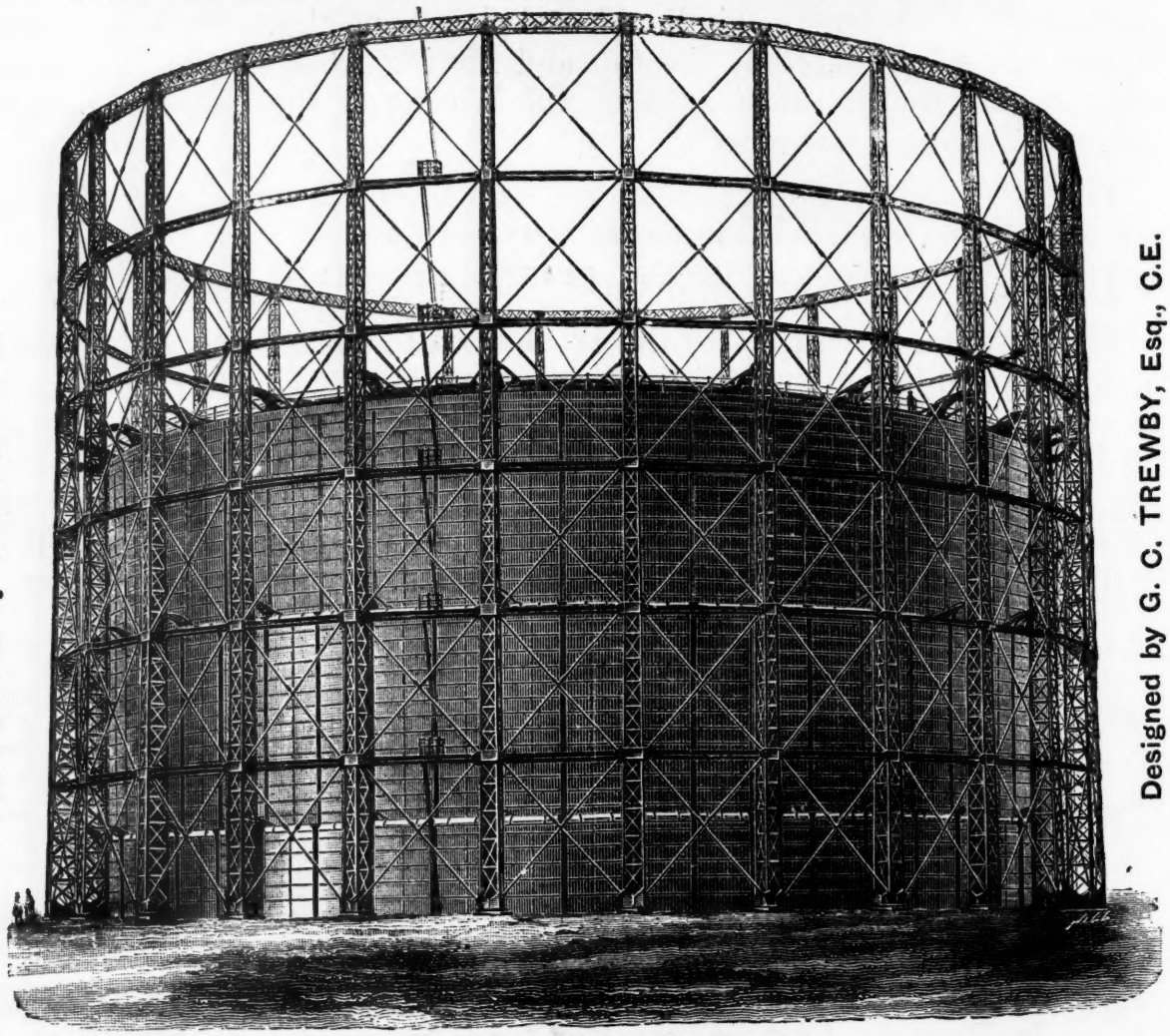
C. & W. WALKER,

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

"FORTRESS DONNINGTON." "FORTRESS LONDON."—Telegraphic.

Constructed by C. & W. WALKER.



Designed by G. C. TREWBY, Esq., C.E.

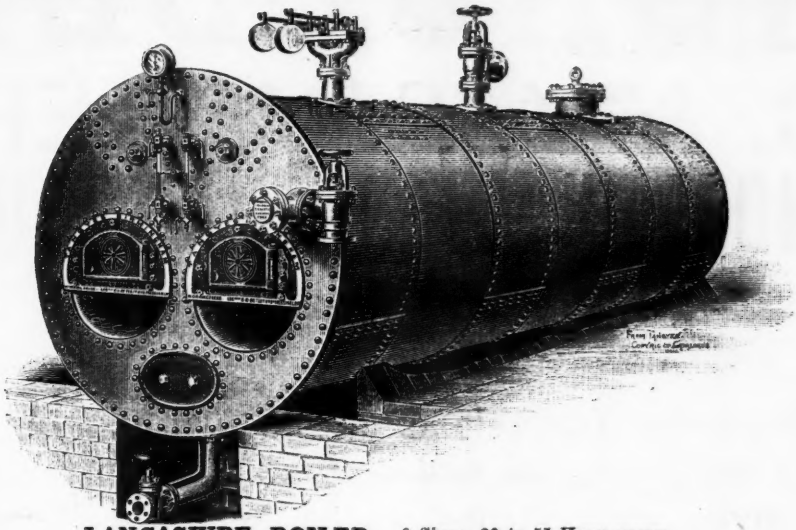
Four-Lift Gasholder, nearly 200 feet high, and 8 million Cubic Feet capacity, recently erected by us for The Gaslight and Coke Company, London.

PURIFYING MACHINES.

PURIFIERS. SULPHATE PLANT.

Weck's Centre-Valve.

TANGYES' REVISED STEEL BOILERS.



LANCASHIRE BOILER. 6 Sizes—30 to 55 Horse power.

MADE OF BEST MILD STEEL PLATES, BY SPECIAL MACHINERY,

IN THE

Lancashire, Cornish, Vertical, Colonial, and Semi-Portable types. Maximum working pressures varying from 70 to 160 lbs. per square inch, according to type.

TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM.

AND LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA, BILBAO, AND ROTTERDAM. No. 91 E.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

WENHAM LAMPS

With Recent Improvements.

PRICES

FROM

STILL THE BEST REGENERATIVE LAMP.

20/-

CHEAPEST! MOST ORNAMENTAL AND RELIABLE!

APPLY FOR NEW SEASON'S CATALOGUE.

THE WENHAM COMPANY, LTD. UPPER OGLE STREET, LONDON, W.

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

459

of these Machines (capable of dealing with 437,315,000 cubic feet of Gas daily) erected and in course of construction. These facts are given as evidence of the apparatus being the most efficient of any in the market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

A large number of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to original pattern Machines at many Works.

TESTIMONIALS.

The Gaslight and Coke Company,
Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

MESSRS. KIRKHAM, HULETT, AND CHANDLER, LTD.,

Gentlemen,

In reply to your inquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

NOTE.—Orders since received for four 3,500,000 cubic feet per day Machines for Beckton; and two 3,000,000 cubic feet for Kensal Green, also for Patent Improved Wooden "Bundles" for original pattern Patent "Standard" Washer-Scrubbers erected at Beckton, Nine Elms, Shoreditch, Pimlico, and Bromley.

Extract from the JOURNAL OF GAS LIGHTING, &c., for Sept. 27, 1892, referring to the visit of the Members of the Eastern Counties Gas Managers' Association to the Lowestoft Gas-Works—

"Mr. J. Ayris has one of Messrs. Kirkham, Hulett, and Chandler's "Standard" Washer-Scrubbers in operation (capable of dealing with 500,000 cubic feet of gas per 24 hours); and of the working of this machine he spoke very highly."

Estimates furnished for cost of altering original pattern Patent "Standard" Washer-Scrubbers, or for the supply of New Machines.

ADDRESS:—

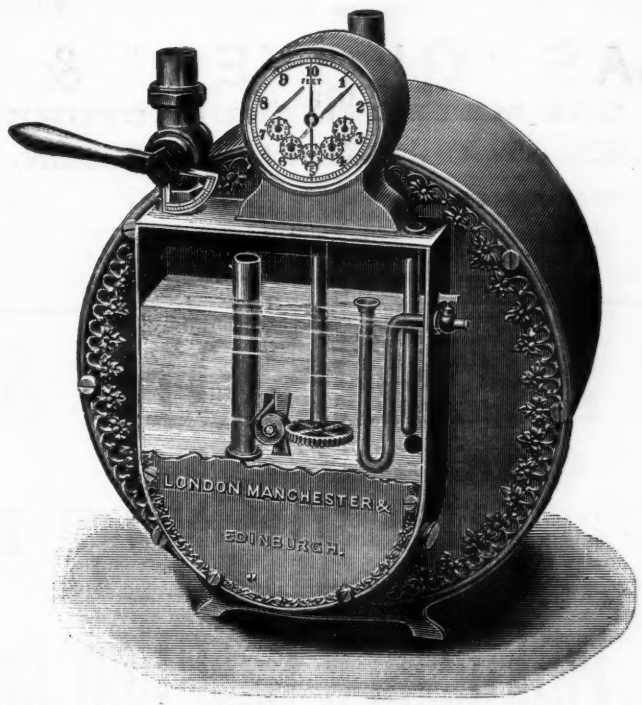
3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER. S.W.

AIR PURIFICATION.

It is now generally agreed that the use of Oxygen, either with or without the diluent Nitrogen, is indispensable for the complete and economical Purification of Coal Gas with either Oxide of Iron or Lime.

Of the various methods proposed for doing this—namely, by drawing in a known percentage of Air with the Foul Gas, or by using a separate and independent oxygen-producing plant (in both of which cases the Spent Lime is rendered innocuous), or by revivifying the sulphided material by exposure to the atmosphere, and then replacing in the Purifiers—the first-named is undoubtedly the most simple and convenient.

All that is necessary is to connect a suitable Air-Meter to the Foul Main on the Retort side of the Exhauster, through which the Air is drawn and measured; and thus the required percentage can be regulated with great exactitude.



The Illustration shows a Meter specially designed for the purpose. The Case is Cast Iron; the Drum and Spout being of Tinned Copper.

A Cock, with Pointer and Quadrant, is provided so that the necessary adjustment can be readily made. This is easily done (the make of Gas being known, and the desired percentage of Air being determined upon) by a minute's observation of the large Index Dial.

Prices and further particulars on application to

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. TELEPHONE No. 3230.

DUTTON STREET WORKS, MANCHESTER. TELEPHONE No. 1545.

BUCCLEUCH STREET WORKS, EDINBURGH. TELEPHONE No. 753.

TELEGRAPHIC ADDRESSES:

"DISC LONDON." "DISC MANCHESTER." "DISC EDINBURGH."

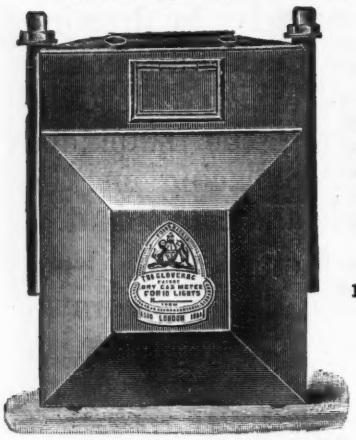
Telegraphic Code used, A.B.C. 4th Edition. Special Code furnished on application.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

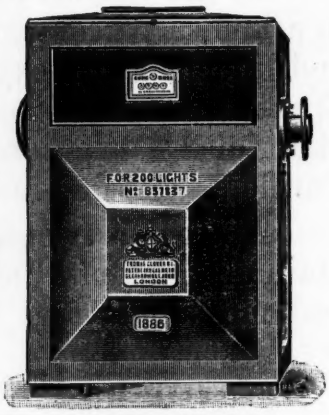
THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

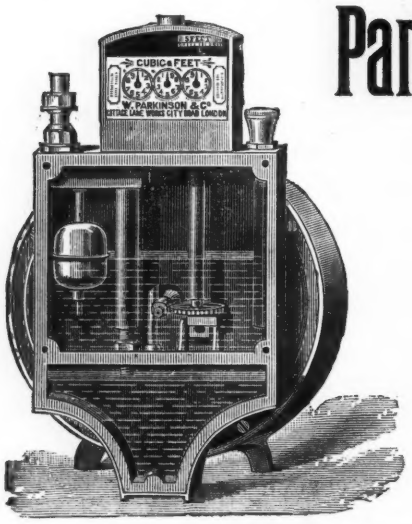
LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & CO.

ESTABLISHED 1816.

MANUFACTURERS OF WET METERS.



Parkinson's Cast-Iron Case Meter.

Works with very little friction.

Will stand very high pressures.

Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.

Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.

Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

(See also Advt., p. 808.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Crystal Palace District Gas Bill in Committee . . . 767
The Future of The Gaslight and Coke Company . . . 768
The Meeting of the Incorporated Institution of Gas Engineers . . . 768
The North of England Meeting . . . 768
The Hull Strike . . . 769

WATER AND SANITARY AFFAIRS—

The Representation of the London County Council on the Thames and Lea Conservancies . . . 769
Laying Mains Outside a Water Authority's District . . . 769

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 770
Electric Lighting Memoranda . . . 770
Water Gas up to Date . . . 771

COMMUNICATED ARTICLE:—

Oxide of Iron: A Monograph. By John T. Sheard, F.C.S. . . . 772

NOTES:—

Shone Sewage-Machines at Chicago . . . 774
The Use of Steam-Rollers on Roads . . . 774
Carbonate of Soda for Purifying Boiler Feed Water . . . 774

TECHNICAL RECORD:—

The Incorporated Institution of Gas Engineers . . . 774
North of England Gas Managers' Association—Half-Yearly Meeting—General Business . . . 775
Terrace, Mr. D., on the Yeadon Rotary System of Gas Making . . . 775

REGISTER OF PATENTS:—

Motors for Gas or Liquid Hydrocarbons—Owen, E. T. . . . 778
Utilizing Gas for Warming or Heating Purposes—Rylands, D. . . . 778
Manufacture of Gas for Illuminating or Heating Purposes (applicable also for the Distillation of Liquid Hydrocarbons)—Dvorkovitz, P. . . . 779
Applying Gas Bags to Gas Mains—Milne, J. (Borlas, E. F. H.) . . . 779
Gas or Combustible Vapour Engines—Robinson, H. . . . 779
Gas Meters—Dolg, W. B. . . . 779
Self Closing Gas Burners—Lake, H. H. (Angell, E. F.) . . . 780
Gas Burners—Thompson, W. P. (The International Self-Closing Gas Burner Company) . . . 780
Patent Notices . . . 780

CORRESPONDENCE:—

Experimenting with a View to the Development of Gasholder Construction 781
A Discouragement for Metric Enthusiasts . . . 781

PARLIAMENTARY INTELLIGENCE:—

House of Lords—Progress of Bills . . . 781
House of Commons—Progress of Bills . . . 781
House of Lords Committee—Crystal Palace District Gas Bill . . . 781
House of Commons Committee—London County Council (General Powers) Bill . . . 785

MISCELLANEOUS:—

Colonial Gas Undertakings . . . 792
Meeting of the San Paulo Gas Company, Limited . . . 793
Meeting of the Odessa Water-Works Company, Limited . . . 794
Meeting of the Monte Video Water-Works Company, Limited . . . 794
Notes from Scotland . . . 795
Current Sales of Gas Products . . . 795
Coal Trade Reports . . . 795
Gas and Water Companies' Stock and Share List . . . 796

PARAGRAPHS.—Death of Mr. J. Urquhart, of Manchester, 769—A Belgian Honour for Mr. R. S. Gardiner, 769—The Vertmarche Gas-Lamp, 770—Electrolysis of Water-Mains, 770—The Price of Gas in Manchester, 770—The Construction of Sand Filters for Water, 772—Prizes for Papers on Atmospheric Air, 772—Southern District Association of Gas Engineers and Managers, 778—Benzol Extraction, 778—Reduction in the Price of Coal, 778—The Water Supply of Oswestry, 781—The Gas and Water Works Purchase Question at Goole, 792—The Late Engineer of the Huddersfield Corporation Gas-Works, 792—The New Water-Works for Mansfield, 792—The Gas Purchase Question at Bideford, 792—Manchester Corporation Water Department, 792—The Hull and Yorkshire Water-Softening Syndicate, Limited, 793—Sales of Shares, 793—The Heckmondwike Local Board and the Gas Company, 794—The Recent Fire at Millbank, 794—Inadequate Water Supply in the Preston District, 796—The Water Supply of Milton and Sittingbourne, 796—The Proposed Purchase of the Runcorn Water-Works, 796—Exhibitions of Gas Appliances, 796—Tarapaca Water-Works Company, 796—Reduction in the Charge for Water at Chatham, 796—South Shields and the Electric Light, 796—The Assessment of the Liverpool Corporation Water-Works, 797—Rotherham and the Water Supply of Greasbro', 797—South African Lighting Company, 797—Ramsgate Water Supply, 797—A Further Concession to the Gas Consumers of West Kent, 797—Proposed Water Scheme for Glossop, 797.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 2, 1893.

The Crystal Palace District Gas Bill in Committee.

THE most important Gas Bill of the session—that of the Crystal Palace District Gas Company—was in Committee last week; and, after the promoters' case had been stated, the several opposing Local Authorities experienced such an accession of "sweet reasonableness," that all the parties were able to come to terms without further to-do. The result is a settlement of the statutory conditions of the undertaking, upon which the Company, the consumers, and the public are to be congratulated. This effect was caused, as Mr. Bidder, Q.C., admitted on behalf of the Croydon Corporation, by Mr. George Livesey's manifest "desire to be fair in the matter." The evidence put upon record by the promoters is of the highest value; and as it was not shaken in any essential particular, it will be most useful as the basis of further reconstructions of gas undertakings upon modern principles. Besides Mr. C. Gandon, Mr. Corbet Woodall, and Mr. H. E. Jones, Dr. Odling and Professor Vivian B. Lewes assisted the Committee in arriving at an opinion favourable to the proposals of the Bill. Broadly speaking, the results of the inquiry are as follows: The Company are to have the additional capital they asked for, to be raised as preference stock; and the standard rate of dividend is to be 5 per cent., with the sliding scale moving by one-eighth per cent. for a penny. Instead of a fixed initial price of gas under the sliding scale, there is to be a "neutral zone" of price, lying between 2s. 10d. and 3s. 2d. per 1000 cubic feet, within which limits variation of selling price is not to affect the rate of dividend.

The above arrangement gives the elasticity for meeting temporary contingencies affecting working conditions which the hard-and-fast sliding scale generally enacted has lacked. It also, we may add, tends to make the sliding scale more certain of operation, by removing the cause of a state of things that has often been seen of late, when directors of gas companies in temporary difficulties have refrained from recommending the full dividends permitted by law. Now, a law that is occasionally suspended to suit a particular party to its operation is thereby proclaimed to be imperfect and weak. If the sliding scale is worth anything at all, it is worth applying always, and in all circumstances; but there has sometimes been a difficulty in carrying out this principle. Another obstacle which this device of the neutral zone overcomes is that arising from the substitution of a standard for a maximum price, which has usually secured an immediate increase of dividend to compensate for the theoretically diminished security. When a gas company who have a maximum price (say) of 4s. 6d. per 1000 cubic feet, and actually sell gas at 3s., have gone to Parliament for the sliding scale, there has always been a tussle over the initial price; and, in several conspicuous cases, Committees have been persuaded into fixing this price at a figure that has enabled the company to clap on some 3 or 4 per cent. of dividend, without the slightest benefit either to the consumers or to the concern itself in the long run. This has, indeed, been one of the standing evils of sliding-scale gas legislation; and its removal is a boon. There is, of course, nothing new in the idea of a neutral zone in this connection. It is, in fact, older than the sliding-scale clauses; for so long ago as 1874, Mr. George Livesey, in the course of his presidential address to the British Association of Gas Managers, spoke in favour of a degree of elasticity in this respect far larger than the more exact conditions of modern gas making would permit. He said: "It ought "to be possible to frame a scheme, to be embodied in a "General Act, that should cause the interests of gas com- "panies and their customers to run side by side . . . "giving the companies a slightly increased dividend for "every reduction in price below a certain minimum "standard, and, to be perfectly fair, the companies would "have to submit to a reduction of dividend if their price "exceeded a maximum limit. It would be unsatisfactory "to fix an exact figure, and permit full dividends at such "a price, with more or less for every variation from it; "but to allow a range of (say) 1s. would give companies "a chance when unexpected difficulties arose, and, more- "over, would give them something to work for in the "other direction." And in the evidence which he gave, as Engineer of the Phœnix Gas Company, before Mr. Forster's Committee in the following year, Mr. Corbet Woodall gave his adhesion to this suggestion. Our report runs: "A sliding scale would have just as much induce- "ment if it worked downwards, as was proposed in 1866, "if there was a margin left within which it should not ope- "rate." So "the whirligig of Time brings in his revenges;" and we have Mr. Livesey and Mr. Woodall in 1893 united in asking a Parliamentary Committee to adopt a proposal mooted in 1874, and superseded in 1875 by a modification which has again been relinquished.

We have been drawn into discussing the Crystal Palace Gas Company's sliding-scale settlement, and have not yet mentioned the almost equally important agreement on the sulphur question. The Company are henceforward to work to a 20-grain standard all the year round, but with a 2-grain "grace;" and the average of a week is to be taken instead of the test for a day, as in the case of the London Companies. The chemical evidence was very strong as

to the practical injury wrought by the latter system, of which the new settlement is tantamount to a condemnation. If there had been any good at all in the system of the Gas Referees, the tendency to copy it in this Suburban Gas Bill would have been irresistible. The system came in, however, for such sharp criticism in the course of the proceedings, that even opposing Counsel who began by citing it had to give it up.

The Future of The Gaslight and Coke Company.

THE announcement which we made a fortnight ago, of the intended retirement of Mr. J. Orwell Phillips from the position he has held so long, and with such distinction, in connection with The Gaslight and Coke Company, can have been no great surprise to readers of the JOURNAL who remembered the circumstances of the last general meeting of the Company. The majority of those to whom Mr. Phillips is more than a name must have been inspired with two ideas—the first, a hope that so hard a worker and agreeable a man may long live to enjoy the honourable retirement which he has earned; the second, a speculation as to how the Company are likely to get on without him. There is no second Phillips in sight. While the thirteen Gas Companies divided London between them in (more or less) peace and amity, they maintained a caste of Secretaries who practically ruled their fortunes. This was only natural; for the chief cares of the Companies in those days were constitutional rather than executive. The Secretaries were omnipotent; the Engineers were wholly subservient. Of this era, Mr. Phillips, Secretary and General Manager of The Gaslight and Coke Company, is the last survivor. He was the Company, to all intents and purposes; and in his hands the Company long grew and flourished, mainly by assimilating its neighbours. The secretarial nursery, however, which might have produced a successor to him, has disappeared with the aggrandisement of the Chartered Company; and he had "no brothers near his throne."

What will the Directors do? They have now to face the greatest responsibility that any of them is likely to encounter during the course of his official career. The only question is whether they will rise to it or sink under it. Mr. Phillips has been such a tremendous working force, that the Directors have not had much to do except draw their not insignificant allowances, and say "ditto" to him. One or two of them may "fancy themselves" as administrators; but the world has refused to acknowledge them for other than highly respectable and meritorious amateurs. They have now a grand opportunity; and there will be much curiosity, and no little anxiety, as to what they will do with it. There would be absurdity in ignoring the fact that the recent history of the Company has been sharply criticized; and what will happen if a weaker hand is entrusted with the helm? The undertaking has not done so much credit as was expected of it to the principle of amalgamation. The capital has gone up; and the selling price of gas has certainly not been so low as it should have been. Is there any particular reason for this result, apart from the unwieldiness of any such enormous industrial undertaking and the imperfection of the human units responsible in their degree for its working? We believe that such a reason exists, and can be stated now without giving offence. It consists, in our belief, in the presence of antagonism among the elements constituting the huge Horseferry Road amalgam. It has been a case of Imperial men against Chartered men, with half-a-dozen other cliques in waiting; or the truth has been much distorted by rumour. What is wanted here, therefore, more than anything else, is thoroughly capable management from an independent standpoint, such as has been known to put fresh life into more than one great railway company. This is a reflection that may well strike Colonel Makins with special force. The Directors may or may not be aware of the personal feuds and jealousies that have for years made for the Horseferry Road the repute of "a house divided against itself;" but with the disappearance of the restraining master-hand they are likely to work more mischief than ever—and this is perfectly needless.

These considerations point all in one direction, and suggest that, whatever is done in the matter of the secretaryship, the new General Manager of The Gaslight and Coke Company had better be a man of proved ability in the conduct of affairs, not necessarily in connection with gas, taken from without the Horseferry Road *entourage*. There are plenty of men in the Company's service with all the technical knowledge required; it is only business capacity that will be lacking. The Directors of The Gaslight and Coke Company can afford to pay for the best administrator they can get for money; and they should have him. He may be difficult to find; but what is the good of a Board of Directors if they cannot select proper men to do their business? How do the railway and steamship and commercial companies in general find fitting agents? Not all of them, of course; for some make mistakes and go wrong. But that good managers are to be found, the history of many a rejuvenated industrial undertaking can be cited to prove.

The Meeting of the Incorporated Institution of Gas Engineers.

THE official programme of the forthcoming meeting of the Incorporated Institution of Gas Engineers has been issued by the Secretary (Mr. Thomas Cole). It is to occupy the three days from Wednesday to Friday, the 10th to the 12th inst., inclusive; the annual dinner being fixed for the evening of the first day. Mr. J. Methven will preside; and the first two days will be occupied with the reading of papers in the theatre of the Institution of Civil Engineers. Friday will be devoted to a visit to Beckton, where there are some novelties to be seen; and the day will be finished by a trip, on the President's invitation, to Epping Forest. There are eight papers in the programme, every one of them dealing with a debateable subject. Mr. G. Livesey heads the list with a paper on "Differential Rates for Gas," which is bound to be argumentative, if not combative; for of the author we may say, as was said of another good man before him, that "he was ever a fighter." Next come two papers relating to carburetted water gas, by Professor Vivian B. Lewes and Mr. A. G. Glasgow respectively, which ought to cover the ground from both ends. These three papers are down for Wednesday, which, with the Inaugural Address, they will fairly fill. On Thursday, Mr. W. Belton, of Shrewsbury, will introduce the important subject of the use of oxygen in gas purification. Messrs. J. J. Hood and A. G. Salamon will treat of the application of Weldon mud to the same purpose. Mr. G. Winstanley and Mr. J. F. Braidwood will discourse upon inclined retort-settings and the methods of working them; and Mr. C. C. Carpenter will represent the opposition that believes in machine-worked horizontal retorts. Differing from the practice on previous occasions, the journey to Beckton on Friday will be made by rail, which will save much time. With the summons to the meeting is issued the annual report of the Council, as given in another column. It records the steady growth of the Institution; 25 applications for admission having been received during the year. Reference is made to the loss sustained by the Institution in the death of Mr. John Somerville; and an account is given of the action taken by the Council, in conjunction with a deputation representing The Gas Institute, in submitting to the Board of Trade Committee on Standards of Light certain representations with regard to the photometric testing of gas. It is also stated to be in contemplation to bring before the meeting a proposal "having reference to the privileges of students." Altogether, the announcements of the Council relating to the forthcoming meeting are of a businesslike, but unpretentious character, and promise well for the success of the gathering.

The North of England Meeting.

THE North of England Gas Managers' Association met on Saturday last at Newcastle, under the presidency of Mr. J. Whyte, of Seaham Harbour, and got through a businesslike programme, the two principal items of which were contributed by Mr. David Terrace, of Middlesbrough, and Mr. Er W. Smith, of Cockermouth. Mr. Terrace's pronouncement was as to the working of the Yeadon revolving retort, which is interesting as a suggestion for dealing with the perennial problem of cheap and effective coal carbonization. The author gave a very fair statement of his own experiences with the appliance, and contented himself with making out a case for further experiment in this direction. It is just possible, however, that the data on which he calculated the economy of the Yeadon apparatus may be questioned by some critics. The gas engineering world is always willing to discuss anything that purports to be an improved system of coal carbonization; and Mr. Terrace's communication is certain to be generally read.

The second paper dealt with Mr. Hislop's retort-settings—giving an excellent account of the author's experience with them; but it was not discussed. The federation project of the South-West Association came before the meeting, and was referred to the Committee to take action upon at discretion. It is, however, significant that the suggestion did not arouse any enthusiasm in the North of England contingent. Mr. Terrace was elected President of the Association for the ensuing year, with Colonel Sadler, J.P., of Middlesbrough, as Vice-President. The next meeting will be held at Middlesbrough.

The Hull Strike.

CONTRARY to all expectation, the Hull strike still drags on; and some trouble of the same kind has broken out in London. This is deplorable, particularly as the character of the issue cannot be affected by anything the leaders or members of the Trades Unions involved can now do or leave undone. The treasury under the control of the strike leaders in Hull received a sudden influx of cash at the latter part of last week; and consequently the unexpected redemption of the strike tickets put the men in better heart for continuing in their irreconcileable attitude. Meanwhile, the paid leaders of the strikers are at loggerheads; and the town has been the scene of an incendiary fire and several outrages on persons and property—more widespread mischief being only prevented by the presence of a strong military and police garrison. It is reported that the number of men nominally on strike, and receiving strike pay in Hull, is very considerably larger than that of men forming the ordinary working complement of the docks. From this it follows that the less worthy of these men are making more out of the strike, and doing it more easily, than they would make if work were proceeding as usual. In short, the loafers and tramps are having a fine time at the expense of the families of the real workers. On the other hand, the Shipping Federation has not the slightest intention of giving way; and individual employers are standing as firmly as if their commercial existence depended upon the issue—which is really the fact. It would never do to give in now. Indeed, there is no occasion to discuss such a thing as being remotely possible; for if the strikers have got their "second wind," so has the trade of the port, or at least so much of it as has not been driven elsewhere. Meanwhile, the authorities responsible for the preservation of order are passing an anxious time. Fortunately, in the Home Secretary, the country has a statesman who has allowed it to be known that he regards it as an essential function of Government to protect life and property. The vain protests of Keir Hardie and others against the reinforcement of the Hull police to the point required for overawing the idlers, and the opposition shown by the latter to the efforts put forward to keep the town from being burnt to the ground, have enlightened the public mind with regard to the real character of New Unionism. There will be no second Mansion House Conference of sentimentalists for the coercion of the employers; and when the New Unionism is compelled to acknowledge defeat, the general verdict will be that it has been rightly served. The uninstructed public committed a grave blunder at the time of the London dockers' strike; and the wind of popular applause puffed up Tillett and his fellows until they really believed themselves to be great and powerful personages. Even this, however, would not have saved the dockers without the Australian subsidy; and now there will be neither British sentimentality nor Antipodean coin to shield the unionists from the consequences of their outrageous folly.

Death of Mr. J. Urquhart, of Manchester.—We regret to record the recent death of Mr. James Urquhart, the Inspector of Gas-Meters for Manchester, to which office he was appointed on its establishment in 1862. Mr. Urquhart's very quiet disposition limited the circle of his friends; but all who knew him appreciated his intelligence, courtesy, and upright character. The deceased, who was in his 63rd year, had been suffering from illness for four months.

A Belgian Honour for Mr. R. S. Gardiner.—We have much pleasure in announcing that Mr. R. S. Gardiner, the Secretary of the Imperial Continental Gas Association, has been decorated with the Order of Leopold by the King of the Belgians. The distinction conferred upon Mr. Gardiner is an evidence of the estimation in which he is held on the Continent by those with whom he has official relations. The congratulations offered to Mr. Gardiner on this occasion by his Belgian friends will, we feel sure, be heartily echoed by many nearer home.

WATER AND SANITARY AFFAIRS.

THOUGH not obtaining quite all for which their modesty permitted them to ask, the County Council have gained so much under their General Powers Bill as will enable them to make some further attempt to embarrass the Water Companies, and interfere with the due supply of water to the Metropolis, supposing Parliament to ratify the present decision. The Council are extremely anxious to preserve the purity of the Thames and the Lea; and they accordingly asked that, whereas they have no place on the Thames Conservancy Board, they should be allowed to send seven representatives to that body. Also that their representation on the Lea Conservancy Board should be increased from one to three. The Select Committee having the Bill under their consideration have agreed that the Council shall have four representatives on the Thames Conservancy, and the entire three in regard to the Lea. That any public good will result from such a change, is what nobody need expect. If the County Council possessed the water supply of the Metropolis, there would be a very fair reason why they should be represented on the Conservancy Boards, seeing that it is a special function of the latter to prevent the pollution of the rivers. But the County Council have charge of the sewage, and not of the water supply. It may also come to pass that one or both of the Conservancy Boards may find it their duty to take proceedings against the County Council for discharging sewage into the stream. It is admitted that if the Council had not purified the discharge at the outfalls, it would have been obligatory on the Thames Conservancy to prosecute them. At the present time, Mr. Rider Cook, the Chairman of the Lea Conservancy Board, complains that the County Council pollute the Lea by the action of a storm overflow connected with the main drainage works. Mr. Binnie admits the existence of the storm overflow, but denies that it does any harm; and he suggests that it is West Ham, and not London, that pollutes the Lea. On behalf of the Council, it is alleged that the London Water Companies are taking too much water from the Lea, so that the river is deprived of its proper volume. Yet, while professing to guard the interests of the population of the Lea Valley, the Council, by means of the Irish vote, succeeded the other day in wrecking the East London Water Bill. We believe that to introduce the County Council element into the Conservancy Boards will generate a clashing of authority, for which there will be no remedy until the representation is restored to its present footing, or until the Council have things all their own way, by being placed in charge of the rivers and superseding the Conservators. For this latter assumption, the County Council are doubtless quite prepared, only the time has not yet arrived. When London is unified according to the County Council pattern, if ever that comes to pass, the "program" will be pushed. As the case now stands, for some reason or other, the Select Committee have seen fit to encourage the County Council in their aggressive policy, by giving them power to spend £10,000 on investigations and negotiations with regard to any subject they may consider it desirable to deal with, professedly in the public interest. That is to say, the Council are to have a special fund of this amount wherewith to carry on a crusade against the Water Companies for the next twelve months; after which they will be in a position to ask for further powers of expenditure in the same direction.

Some special and complex questions arose in the case of *Jones v. Conway and Colwyn Bay Joint Water Board*, recently tried by Mr. Justice North, and reported in the JOURNAL last week (p. 735). Points of this sort are, of course, interesting mainly to the immediate litigants and to the lawyers. But, beyond the question of construing a particular Provisional Order as confirmed by Act of Parliament, there was an argument of considerable general interest to other suppliers of water and owners of land. The local aspect of the action depended upon whether the Water Board was to be regarded as a "local authority" within the meaning of section 54 of the Public Health Act, 1875, and therefore possessed of the same powers, and subject to the like obligations, in respect to the laying of mains. The plaintiff, as tenant for life of the land on which the Board claimed the right to enter, objected that

such right would not arise until the defendants had acquired the easement, either by purchase or pursuant to the provisions of the Lands Clauses Consolidation Act. Upon this branch of the case Mr. Justice North was against the landlord; his Lordship holding that defendants had the right of a local authority, and that the earlier part of the Public Health Act applied, *mutatis mutandis*, to the laying of water-mains. Then, however, came the further and more general issue, whether the defendants were not bound to give certain notices prescribed by the Act, before entering upon the plaintiff's land. The learned Judge pointed out that the defendants, after giving reasonable notice to the occupier, could go upon land in their district for the purpose of laying water-mains, and could do the same out of their district, subject always to the provisions of the Act as to extra-district sewage works. Next, Mr. Justice North dealt with section 32 of the Act as bearing on the question of notices, which, if given by the local authority, would enable a landowner to bring the matter before the Local Government Board, with the view of obtaining a special local inquiry. It was fully admitted, in the case before the Court, that this section had been ignored; and, in the result, the learned Judge declined to hold that the express enactment was overridden by the general provisions in another part of the Public Health Act. In these circumstances, the necessary condition precedent not having been complied with, the Court decided that the Water Board had not acquired power to take possession of the plaintiff's land; and his Lordship granted an injunction to prevent them from doing so until the provisions of the Public Health Act had been duly complied with. The fairness of this ruling will scarcely be questioned; it being obviously desirable that those who seek to use any sort of compulsory powers shall do so subject to strict compliance with the conditions upon which those powers have been conferred by Parliament.

The Vertmarche Gas-Lamp.—We are informed by Messrs. H. Greene and Sons, of Cannon Street, that the action commenced against them by the Deimel Light Company, Limited, in respect of the above lamp, has been dismissed by order of the Court, with costs, for want of prosecution.

Electrolysis of Water-Mains.—The electrolysis of water-mains by grounded circuits has been causing some trouble in Sault Ste. Marie (Mich.). Dr. F. M. Taylor writes to the *Engineering Record* that, when the matter was discovered, the Department of Public Works was much puzzled as to the cause; but, having read that similar phenomena due to electricity had been noticed in other cities, he has become certain that the electric current was the cause of the leaks. These were directly under the railway, and at a depth of about 6 feet. The erosion was diffuse and irregular; the holes generally approximating an oval or elongated oval, with the longer axis parallel to the axis of the pipe. The eroded surface was very irregular, pitted, and bright as a new silver coin. The holes were at distances varying from 1 foot to 2½ feet apart, and on the upper surface. The deeper holes were directly under the rails on each side of the track. The limit of erosion seemed to embrace a length of about 7 or 8 feet.

The Price of Gas in Manchester.—There are signs of further agitation for a reduction in the price of gas in Manchester, though those who contemplate such a movement admit that the prospects of success are not hopeful just now. After the rebuff which they received last year, when they proposed a reduction of 3d. per 1000 cubic feet, which the City Council refused to sanction, the Gas Committee are not likely to move again in the matter for some time to come. They would do so, no doubt, if there were pressure from outside; but the gas consumers of Manchester have not yet risen to the point of organization, and the pressure from them is not likely to be very strong. On the other hand, the Corporation are confronted with an increasingly large expenditure for sewage and other works, and the "relief to the rates" which the gas-works afford is not at all likely to be relinquished. From a summary of the current year's estimate published in the local papers, we gather that the gas undertaking is expected to pay into the borough fund a sum of £64,321. If this amount, or a considerable portion of it, were applied to the reduction of the price of gas, the consumers would have no cause of complaint. But the ratepayers might not like so large an addition to their direct burdens; and so nothing will be done. Attention has again been directed to the question by the reduction which the South Metropolitan Gas Company have lately made. It is argued, with some force, that, other things being equal, gas ought to be cheaper in Manchester than in London, where wages are higher, and the cost of carriage of coal is a more considerable item of expenditure. But, as a fact, the South Metropolitan Company are now selling gas at 1d. per 1000 cubic feet less than is charged in Manchester.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 796.)

THERE was no material incident in the past week which was calculated to bring about an improved state of feeling in the Stock Exchange markets generally; but rather the reverse, seeing that another Australian bank (small and unimportant albeit) was obliged to suspend. And yet, strange to say, there was a decided improvement in business; some markets being quite brisk, and prices on the whole showing a good tendency to improve. It is not improbable that the Australian crisis may produce activity in other markets. Much money will have been withdrawn from Colonial banks and financial undertakings, which will be seeking investment in other quarters; and, warned by the past, the investors will probably select more substantial securities. It is, therefore, not unlikely that first-class stuff may rise even above the present choice figures. Money was scarcer, and less abundantly forthcoming to the demand; so that rates showed a material advance. The condition of the Gas Market was almost identically the same as in the preceding week; business being very quiet, and prices still rising steadily. The advance in values is most conspicuous among the debenture and other preferential issues, which now stand at figures that were probably never contemplated in past years. But, in addition to these, the open stocks of some of the choicest and strongest undertakings have made upward moves. In Gaslight issues, the "A" maintains the remarkable evenness it has displayed for several weeks past—never varying much outside 222. The secured issues were in full swing; and several of them have gone up in quotation. Hardly any business was done in South Metropolitans; and not even a higher bid for "A" and "B" availed to bring any stock into the market. A single transaction in the old stock was all that was marked in Commercials; but there would be no lack of buyers if stock were to be got. The Suburban and Provincial Companies were even quieter than ever; and the only change is a slight rise in Brentford. Continentals were but little dealt in, though prices were good, and European (part paid) were higher. Of the rest, the only issue calling for remark is Melbourne, which was adversely affected by the troubled state of the Colony. Business in Water was at a low ebb; but the tendency was favourable, and pretty well every company improved in price.

The daily operations were: Gas opened very firm, but quiet, and remained so throughout Monday. Brentford old and Gaslight "K" rose 1 each. In Water, Chelsea rose 2; and New River, 1. Tuesday was no busier; and the only move was a rise of ½ in European (part paid). Wednesday's transactions were still more restricted, and quotations remained unchanged. Thursday was almost stagnant. Melbourne debentures fell 1. There was a slight degree of activity, comparatively speaking, on Friday; and prices began again to go up. Gaslight "C," "D," and "E" rose 1 apiece; ditto "F" and "G," 1 each; and ditto "H," 1; and South Metropolitan "A" and "B," 2 each. In Water, East London, Grand Junction, Lambeth, and Southwark rose 1 each. Saturday was a quiet finish to a quiet week; and all quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

Mr. Gisbert Kapp on the Economics of Electric Lighting—The Metropolitan Electric Supply Company—The Dundee Central Station.

AN interesting and instructive paper was read before the Society of Arts on the 19th ult., by Mr. Gisbert Kapp, on "Some Economic Points in connection with Electricity Supply." It is possible that we may have something further to say respecting certain views advanced by Mr. Kapp; but for the present, we desire only to acknowledge the general excellence of his paper, and to recommend it to anybody desirous of seeing how the electric lighting industry stands at the present time in the estimation of a most competent, honest, and independent expert. Mr. Kapp's paper has the character of a general review of those matters in connection with electric lighting which naturally assume most importance in the eyes of users of incandescent lamps, whether they are customers of a central station undertaking or generate their own electricity. He does not say much that is novel about the condition of the former order of patrons of electricity, except that "those who take the trouble to keep accurate accounts generally find that the light is not nearly so expensive as they had at first supposed." To the latter, however, he addresses several pointed counsels, aimed at keeping down the working expenses; and he enforces his advice by illustrative examples. One point comes out very clearly from Mr. Kapp's remarks—that storeage batteries are very expensive additions to a private lighting plant. In the course of the discussion which followed the reading of the paper, a luminous criticism upon home-made electric light was uttered by Mr. Fletcher Moulton, Q.C., who said that, having at one time been one of those who make their own electricity, he "retained his peace of mind during that period by steadily abstaining from learning in any way how much it cost him."

The Electric Light Company with the largest present connection in England is the Metropolitan Electric Supply Company, who have five generating stations, feeding 134,463 lamps

scattered over a district of more than 4½ square miles in extent, and presenting much variation of character. The capital expenditure now stands in the books at £550,859; and a further outlay of £50,000 is declared to be necessary, in order to complete the Company's system. Last year the Company had a gross revenue of £54,571; and the accounts show a profit balance of £18,168, before providing for depreciation. The sum of £4000 is appropriated to depreciation; and £1000 is written off the preliminary expenses. Out of the so-called net balance, the Directors recommend the small dividend of 4s. per share, which absorbs £9980. The number of lamps connected shows a steady increase; while the working expenses do not increase in the same proportion. It appears, however, that the undertaking will have to do a great deal more before its condition can be regarded as satisfactory. It is a remarkable circumstance that the Company should have raised upwards of £50,000 last year for electricity alone, in a district of the town which a very few years ago did not know that it wanted anything of the kind, and which has certainly not paid less than before to the purveyors of other means of lighting; but it costs too dear to earn even this handsome revenue, even though much of the working expenses is still charged to capital. The future of the Company turns upon the question of whether they can double their income without increasing their working expenses; and he would be a bold man who would promise that this can be done within a year or two—as soon, that is to say, as it will be wanted. It is the same problem for all central-station companies.

An elaborate account of the electric supply station of the Dundee Corporation has been published in the *Electrical Review*, from which we gather that the system adopted is the three wire, and in some respects resembles that followed by the Westminster Electric Supply Company. Siemens dynamos are driven by directly-coupled Willans engines, served by Lancashire boilers; and accumulators are used for regulating the current. The whole of the work has been designed by, and carried out under the supervision of, Messrs. Urquhart and Small, who seem to have done a workmanlike job for the Corporation. As our contemporary remarks, in commenting upon the station, the purely electrical fittings of such establishments are "becoming more and more of a fixed pattern." The time is gone when great things were expected of artful machinery and ingenious dodges in connection with town lighting stations; and it is recognized that the proper thing to do is to lay out capital upon plant of best material and workmanship, and leave the determination of commercial success or failure to those larger influences which overmaster petty clevernesses. All that can be done for Dundee in the way of good fitting-up has been provided; and it is hardly likely that the system will have to be changed, as in the case of Bradford. Dundee will resemble Bradford in one respect, however—there is a Corporation gas-works to fall back upon when the till runs empty in the electricity department. It is curious that no eminent electrician has yet favoured the world with a paper "On the Advantage of having a Gas Undertaking at the back of an Electric Light Venture;" although many have gone very near to the point, by confessing unaffected regret that gas companies in general, at least in this country, have given them no orders.

WATER GAS UP TO DATE.

It is now some months since we issued a challenge to the partisans of water-gas manufacture in this country, to state what they were doing in justification of the claims put forward on their behalf, mainly through the Institution of Gas Engineers. Another Institution meeting is nearly due, and in all probability water gas will be once more freely discussed on the occasion; but in the meantime, we take an earlier opportunity of repeating our inquiry concerning the actual performances of the water-gas plants in use in different parts of the United Kingdom. The publication last week of Mr. F. T. C. Linton's report upon the "Manufacture of Gas from Oil," brings the question into prominence once more, for this statement contains some strong observations upon different notorious processes. That Mr. Linton should lean strongly towards the Young process, is in the circumstances natural; but he must excuse us for remarking that his judgment of the process as being "a complete solution of the difficulty hitherto experienced in using heavy mineral oil gas for gas making," is hardly supported by the description he gives of the plant, or of its working, or of the material intended to be used in it. The Young process is doubtless good for much; but it is distinctly premature to speak of its "completeness," in the absence of all exact data respecting the capacity of plant per unit of floor space, its cost, and its suitability for dealing with different kinds of heavy mineral oil. When all is said, moreover, it does not appear that the shale oil resources of Scotland would go very far to provide gas for this kingdom alone, to say nothing of other parts; and a plant that does very well at Peebles, might not be the most suitable, say, for Beckton or East Greenwich.

The water-gas people pure and simple must be patient indeed, if they remain quiescent under such a sweeping generalization as that which Mr. Linton applies to the London trials of the "Lowe and kindred processes"—that "the results, both as to cost and as to the reliability of the processes to give a steady quality of gas, have not answered expectations." Mr. Linton dismisses the American record of water-gas manufacture by saying that there, "coal gas is very dear, and oil at its cheapest; and that many things are put up with there which would not be tolerated in this country." He does not forget the old objection to the gas produced under these (American) processes, of being "so largely composed of the deadly poison carbonic oxide gas." It does not take Mr. Linton long to dispose both of the Pintsch system and carburetting coal gas by light petroleum spirit; and so he falls back upon Peebles as the only place where a Scotch gas engineer may hopefully seek assistance. As already remarked, this is very well so far as it goes; but does Mr. Linton fairly cover the whole ground? In our opinion, this is precisely where his well-reasoned report fails to be convincing.

Curiously enough, while Mr. Linton must have been putting the finishing touches to that survey of modern methods of oil-gas manufacture—which extended across the Atlantic and to London, only to return to Peebles—we were giving to the world through our "Register of Patents" the skeleton description of Professor Vivian B. Lewes's system for manufacturing carburetted hydrogen gas, in which a critical observer might find plenty of reason for suspecting that the last word in regard to water gas has not been said by the designers of the "Lowe and kindred processes" mentioned by Mr. Linton. Patent specifications and drawings may, of course, mean something or nothing. In this case, the patent relates to a method of and plant for gas manufacture that existed in brick and iron long before their description was put on paper. For the last two years, Professor Lewes has been patiently working out his ideas as to how water gas should be made; and first in a small way at Greenwich, and next upon an industrial scale at the works of the Aldershot Gas Company, he has had in experimental operation the plant upon which the patent published by us on the 11th ult. has now been obtained.

Simply, it is Professor Lewes's plan to make gas from coke, water, and the cheapest mineral oil, that shall be as like as possible in essentials to good coal gas, only much cheaper and purer from sulphur. He claims that, by his apparatus, illuminating gas of any desired quality from 14 to 30 candles can be produced at will, with practically no greater proportion of carbonic oxide than common coal gas, if this point is insisted upon. He does this by engrafting upon an ordinary gas producer a supplementary chamber, in which hydrogen is made by the action of heated iron—preferably in the form of hematite ore—upon superheated steam. The carburetting is effected by injecting mineral oil into the bed of incandescent fuel in the producer; and it is claimed that the action of the hydrogen in the gas is so greatly superior economically to that of carbonic oxide, that the illuminating duty of the oil used is considerably enhanced, as compared with the performance of any other water-gas apparatus known. It is reported that working discontinuously, and consequently not under the most favourable conditions, the Lewes plant has made from 21 to 22 candle gas, with a consumption of less than 3 gallons of oil per 1000 cubic feet—a result which, if it can be substantiated, is deserving of the description unparalleled.

Professor Leonard T. Thorne, Ph.D., &c., has analyzed a sample of uncarburetted gas from the experimental Lewes apparatus, with the following results:—

	Crude Gas.		Purified Gas.
Sulphuretted hydrogen } Carbonic acid }	4·25	..	—
Carbonic oxide	6·44	..	6·73
Hydrogen	83·75	..	87·46
Nitrogen	5·56	..	5·81

In this case, anthracite coal was used for fuel instead of coke, which probably accounts for the rather large percentage of sulphuretted hydrogen and carbonic acid found. This result is sufficiently remarkable; but Professor Thorne justly points out that the imperfect construction of the generator, &c., could be easily remedied, and that it would then be possible to produce pure hydrogen containing only traces of impurity. For making illuminating gas, however, this high degree of purity is not essential. Altogether, Professor Thorne thinks very highly of the Lewes plant and process.

We draw attention in this way to the Lewes device, because it appears to contain the only fundamentally novel feature in water-gas making that has been heard of since Lowe turned the academical Tessié du Motay plan into an industrial apparatus. Nobody can say as yet whether or not the new arrangement is worth anything for commercial purposes, but it is not betraying a secret to state that several gas engineers are so struck with the notion, that they are taking steps to test its value on a large scale. At the worst, the Lewes plant can be no worse than any other water-gas making apparatus; while if there is anything in the asserted superiority of hydrogen as a carrier of luminous hydrocarbons, and if the objection to too much carbonic oxide in the mixture carries any weight—why, then the Lewes apparatus will occupy an exceedingly strong position. Twenty years ago and more, when the late Mr. R. P. Spice was experimenting upon water gas, he was greatly troubled by the affinity between the iron of the superheated steam-pipes and the oxygen of their contents. He made a little hydrogen in this way; but it was not by any means a safe, cheap, or convenient method. Professor Lewes has not only made good use of a reaction that sorely troubled the early water-gas makers; but he has also given his conceptions a practical shape which smacks more of the gas-works than of the laboratory, for there is nothing about his philosophically-

arranged apparatus that a plain mechanic or "handy man" cannot be trusted to attend to.

Mr. Linton is not to be blamed for his non-acquaintance with what Professor Lewes has had in hand all these months; but it is not too much to urge, in view of the sound experimental grounds upon which Professor Lewes has built up his process, that there should be a suspension of judgment in regard to the prospects of carburetted water gas in the United Kingdom, until more has been heard of his "carburetted hydrogen" system. It is, at any rate, a distinct advance upon the "Lowe and kindred processes," which have been imported into this country from the States with a reputation born of cheap and easily-worked oil. So far as the nature of the product is concerned, there is not a pin to choose between the Lowe and the other American devices that have been planned with a sole view to circumventing the Lowe master patent —which, by the way, never had any validity in Europe, and has now already lapsed in the States. "Rule of thumb" has moulded American water-gas engineering practice into its actual condition at home; and it is hardly wonderful if the same method has not always triumphed over the difficulties incidental to recent attempts to acclimatize the *technique* of Lowe, and his followers upon this side. It is quite possible that "rule of thumb"—meaning the practical, common-sense methods of the gas maker—may have to pass over Professor Lewes's designs before they correspond year in, year out, to the needs of a gas-supply district. All the same, there is an idea in it which is not to be found elsewhere; and this alone would make the system respectable in the estimation of those who think that a new thing should possess some novelty. The lack of this was the rock on which the Samson Fox water-gas scheme split. It is almost necessary to apologize to Professor Lewes for mentioning that miserable business in the same column with his plan, but he will acquit us of uncomplimentary intention.

The Construction of Sand Filters for Water.—At the last meeting of the German Gas and Water Works Association, Mr. S. A. Samuelson, Chief Engineer of the Hamburg Water-Works, read a paper on the disposition of the layers in sand filters used for purifying water. In the course thereof, he gave a summary of the principles which, in his opinion, apply to the design of filtration works. The construction of a filter is governed by three different considerations—its reliability, management, and permanence. The best sand is one in which the grains approximate closely to 0·04 inch in diameter. If the sand is but little finer than this, the operation of the filter is quite different. The reliability of a filter rests on the thickness of the layer of sand, and increases with it; and Mr. Samuelson recommends 3 ft. 4 in. All sand intended for filtering purposes should be washed before use. After each cleaning of a filter, there should be a period of repose, to allow time for the formation of a thin film about the grains of sand. Preliminary settlement before filtration is often of value; but it should never be used as a reason for decreasing the size of the filter-bed, or increasing the rate of filtration. The variation between the water-level in the filter and clear-water basins should not become too great; the maximum allowable difference depending on the character of the water to be filtered and the character of the filtering films. Sand filtration is never able to remove all the micro-organisms; and a small number pass through the material or develop during the passage of the water. The object of filtration is their reduction to the smallest possible number.

Prizes for Papers on Atmospheric Air.—In October, 1891, Mr. Thomas G. Hodgkins, of Setauket, New York, made a donation to the Smithsonian Institution, the income from a part of which was to be devoted "to the increase and diffusion of more exact knowledge in regard to the nature and properties of atmospheric air in connection with the welfare of man." The Smithsonian Institution now announces the following prizes to be awarded if satisfactory papers be offered in competition:—(1) A prize of $10,000 for a treatise embodying some new and important discovery in regard to the nature or properties of atmospheric air. (2) A prize of $2000 for the most satisfactory essay upon (*a*) the known properties of atmospheric air considered in their relationships to research in every department of natural science, and the importance of a study of the atmosphere considered in view of these relationships; (*b*) the proper direction of future research in connection with the imperfections of our knowledge of atmospheric air, and of the connections of that knowledge with other sciences. (3) A prize of $1000 for the best popular treatise upon atmospheric air, its properties and relationships (including those to hygiene, physical and mental). This essay need not exceed 20,000 words in length; and should be written in simple language, and be suitable for publication for popular instruction. (4) A medal will be established, under the name of the "Hodgkins Medal of the Smithsonian Institution," which will be awarded annually or biannually, for important contributions to our knowledge of the nature and properties of atmospheric air, or for practical applications of our existing knowledge of them to the welfare of mankind. The treatises may be written in English, French, German, or Italian; and they should be sent to the Secretary of the Smithsonian Institution, Washington, before July 1, 1894, except those in competition for the first prize, the sending of which may be delayed until Dec. 31, 1894.

COMMUNICATED ARTICLE.

OXIDE OF IRON: A MONOGRAPH.

By John T. Sheard, F.C.S.

(*Concluded from p.* 728.)

The Absorption of Hydrocarbons by Coal Gas.

That coal gas will, under favourable circumstances, take up and retain hydrocarbon vapours properly presented to it, is just as certain as that, given different conditions, the converse will take place. But, it may be asked, is such a gain in illuminating constituents a permanent one? Will the hydrocarbons thus introduced into the gas be retained by it, or will they be deposited at the first syphon-pot? The answer to which must be that it is entirely a question of degree, and depends upon the circumstances to which the gas is subsequently exposed. If ordinary coal gas be subjected to sudden and severe refrigeration, either in the holder or in its passage through the mains, it is almost certain to deposit a portion of its valuable hydrocarbons; and this tendency is enormously increased when the gas is stagnant. But under changed conditions the deposited illuminants are re-absorbed by the gas. It is often remarked, during severe weather, that when the gas is first lighted in a room, its illuminating power is very inferior; and especially is this noticed if the experiment be made at a considerable distance from any other sphere of gas consumption. But, after a short time of burning, the flame attains its wonted brilliancy. This observation applies as well to gas produced in the ordinary way, as to where air is employed in its purification; and it can only be explained on the above hypothesis. Mr. Henry Aitken found that even 25 to 27 candle gas would take up, at a temperature of from 40° to 50° Fahr., a very considerable quantity of light naphthas, and retain the same *so long as the gas was in motion.** On the current being stopped, some of these added illuminants were dropped from the gas, to be re-absorbed by it when again in motion. My own experiments have shown that 19 to 20 candle gas, purified by the aid of 2½ per cent. of air, is delivered at the consumer's burner, eight to nine miles distant from the source of supply, without any appreciable loss of illuminating power, even under the condition of severe and prolonged frost. In ordinary circumstances, therefore, the gas may be confidently expected to carry right up to the point of consumption the illuminating power which it retains on leaving the holder.

The second of the two causes above referred to, as tending to counteract the deleterious effect of the added nitrogen, lies in the higher temperature which the increased chemical activity produces within the purifier. Because of this higher temperature, valuable hydrocarbons, which otherwise would be condensed and deposited in the purifying material, are retained in the gas. That this is no fanciful supposition will be appreciated by whoever has observed the crystals of naphthalene glistening on the under surface of a purifier cover which has been kept cold while within the purifier more than usual chemical activity has been going on. The most satisfactory assurance that the two causes specified do combine to bring about the desired result is the fact of so much gas being now produced, to which has been added more than sufficient nitrogen to cause, were no such compensating influence at work, so serious and obvious a deterioration of the quality of the gas as could not conceivably be tolerated.

The Action of Air in an Oxide Purifier.

The first indication that the admission of air with the gas is bringing about increased chemical activity within the purifier, is to be found in the higher temperature maintained therein. This increased temperature is, of course, primarily due to the reoxidizing of the fouled oxide—a reaction which, as shown in treating of revivification (*ante*, p. 680), develops a high degree of heat. But it is to be noted that the increased chemical action brought about in the purifier is cumulative. For not only does the continual revivification afford renewed surfaces of active oxide for absorption of sulphuretted hydrogen, but also the higher temperature maintained in the purifier is itself, as shown by the experiments quoted in an earlier portion of this article (*ante*, p. 680), more favourable to the full development of the purifying power of the oxide. Thus, under favourable circumstances, the process may go on, without attention, until the oxide is so fully charged with sulphur that it may be removed as "spent." Under less favourable conditions, the advantage arising from admission of air will still be found in the much longer duration of a charge of oxide in the purifier. It should, at least, run double the usual length of time before needing to be changed.

From theoretical considerations, it might indeed be expected that, with the adoption of the air process of purification—taking into the purifier as much air as is indicated by theory for continuous revivification (that is, at the rate of 2½ per cent. of air for 1 per cent. of sulphuretted hydrogen), with a slight margin in excess for safety—the necessity for reopening an oxide purifier until its contents were fully spent would be done away with. But while in some cases, where specially favourable circumstances exist (as, for instance, where the purifying capacity is large as compared with the quantity of gas to be purified), this happy result may be experienced, it is by no means general. Usually it is found that, sooner or later, but long before the

* See JOURNAL, Vol. XXXI., p. 803.

oxide has done the full amount of work expected of it, the purifier must be thrown out of action for one of two causes—viz., an abnormal amount of back-pressure, or through sulphuretted hydrogen passing forward with the gas; and its contents must be taken out and revivified in the usual way. Why this disappointing result occurs, instead of the desirable one to be expected from theory, is the most important problem remaining unsolved in connection with oxide purification. A course of experimental investigation, with the view of thoroughly sifting the matter, is greatly to be desired; for its solution would mean the possibility of effecting a great saving in labour. Towards this end, the following suggestions on the subject are offered.

The increase of back-pressure would appear to be due to one of two causes, of quite opposite character, though producing the same result—viz., either (1) to caking of the oxide produced by the development in the purifier of a considerable degree of heat, through intense activity of the oxide, resulting eventually in local fusion of the sulphur contained in the material; or (2), where chemical activity is not so pronounced, to the accumulation in the material of an excess of moisture, through the temperature not being high enough to ensure the continual expulsion, as formed, of the water produced in the reaction—

$$Fe_2O_3 + 3H_2S + 3O = Fe_2O_3 + 3S + 3H_2O;$$

thereby soddening the material, and clogging up its pores. The latter suggestion serves also to explain the failure of the process, as indicated by the passing of sulphuretted hydrogen; the low temperature and excessive moisture preventing or greatly hindering the process of revivification from taking place. The raising of the temperature of the purifier by artificial means would therefore seem to be indicated as the remedy for this evil.

The only likely suggestion that has hitherto been advanced with the view to remedy the defects above alluded to, is that of Mr. F. G. Dexter, contained in the paper read by him before The Gas Institute in 1892,* and which consisted in admitting steam with the current of gas passing through the oxide purifiers. By this addition to the air process of purification, he claimed to have more than doubled the quantity of gas purified per change of box. He attributed the previous unsatisfactory working of the oxide, as evinced by its caking and thereby causing excessive back-pressure, to the absence of sufficient moisture in the material; while the improvement observed after the addition of steam was said to be gained through providing this needful but deficient moisture. This explanation can only be accepted as satisfactory by assuming that the temperature of the mass of oxide rises to 212° Fahr.; that is, to the point at which its contained moisture would be entirely vaporized. For consider that the chemical reaction of sulphuretted hydrogen and ferric oxide (as given above) is productive of water—each molecule of active Fe_2O_3 producing three molecules of H_2O—which must either be deposited in the material or carried forward with the gas; the latter being itself, on entering the purifier, saturated with moisture. Should, however, the temperature within the purifier attain the high degree mentioned, the activity of the oxide would most likely cease, through the vaporizing of all the water present; for it has been shown by Richardson that, for the promotion of chemical union, the water must be in the liquid state, and not as vapour.† It will hardly be contended, however, that so high a temperature obtains generally throughout the material in the purifier; though it may be, and probably is, in isolated places, as high or higher.

Again, it is doubtful whether mere drying of the oxide, *during the passage of the gas*, would bring about such a change in its physical state as to produce the increased resistance which is shown by the higher back-pressure. This is, however, a matter which might easily be settled by experiment.

In support of his contention that lack of moisture is the great evil, Mr. Dexter refers to the dryness of oxide treated with air, when it has to be taken out of the purifier for revivification; the fouled oxide having a dry and semi-crystalline appearance. But this dryness is more apparent than real; for, on heating, steam is evolved in abundance. If this heating, and with it the liberation of moisture, can be brought about within the purifier instead of out of it, there seems no reason why the process of revivification should not go on to its fulfilment, with prolonged "life" of the oxide within the box. In this connection it is to be remarked that it is generally the box which heats the best and most equably that has the longest "life."

Perhaps the more reasonable explanation of the cause of excessive back-pressure is to be found in fusion or coalescence of the particles of deposited sulphur locally, where the activity of the oxide is most pronounced, and the heat the greatest. The function of the steam in the experiments made by Mr. Dexter is, therefore, I think, as follows: It keeps the temperature of the active box from rising so high as to fuse the contained sulphur; while, on the other hand, it raises the temperature of a sluggish or inactive material to the point at which chemical action is promoted and facilitated. That this is the correct explanation is, I think, proved by the fact that the improvement recorded during the winter months, with the aid of steam, is far superior to that in the summer months. Were the steam simply of value as furnishing moisture to the oxide, the reverse might be expected; as it is but reasonable to suppose that dearth of moisture would ordinarily be greater in the summer than in the winter months.

* See JOURNAL, Vol. LIX., p. 1171.
† See *Chem. Soc. Journal*, Vol. LI., p. 801.

The Employment of Oxygen in Gas Purification.

The use of pure oxygen instead of air as an aid to purification has been strongly advocated of late years. In connection with purification by lime, wherein its value in reducing the "sulphur compounds" in the gas is a great recommendation, it has been adopted in several gas-works; but Mr. Harrison Veevers, of Dukinfield, is the only gas manager who has been bold enough to apply it as an aid to purification by oxide alone. In a paper read before the Manchester District Institution of Gas Engineers in November last,* he summarized the advantages it offers as follows:—

1. Saving of the labour ordinarily entailed in revivifying oxide.
2. Improved illuminating power through the admission of less air into the gas.
3. Improved value of spent oxide; a higher percentage of sulphur being obtained in it.
4. Reduced quantity of oxide employed.
5. Greater uniformity in the illuminating power of the gas.

Whether or not the employment of oxygen presents advantages sufficiently superior to those offered by common air to justify its greater cost, time and experience alone can decide. It is therefore earnestly to be desired that, when Mr. Veevers has had a longer experience of this novel method of purification, the gas world will be favoured with his fuller and riper views thereon.

Appendix.

After I had completed the foregoing article, but before revising the proof of this last instalment, I found that valuable light was shed on one branch of the subject in a paper printed in the "Philosophical Magazine" for May, 1892 (Vol. XXXIII., p. 471), on "Some Properties of Dried Hydrogen Sulphide Gas," by Mr. R. E. Hughes, B.Sc., F.C.S., of Jesus College, Oxford. The author's attention had been drawn to the subject by Mr. V. H. Veley, M.A., who, having proved that dry hydrogen sulphide (sulphuretted hydrogen) is not absorbed by dry calcium oxide (quicklime),† thought it a matter of much interest to determine whether or not the behaviour of the gas with other metallic oxides was the same.

Mr. Hughes found that dried sulphuretted hydrogen was quite incapable of combining with absolutely dry magnesia or with barium monoxide (baryta). As to oxide of iron, he remarks that "the results so far obtained point to the conclusion that with perfectly dry materials no change would take place." On experiment, he found that 5·8108 grammes of sesquioxide of iron (Fe_2O_3) absorbed 0·0832 gramme, or 1·4 per cent., of sulphuretted hydrogen. But he goes on to remark that "the methods adopted for drying the oxide have not been sufficiently effective to ensure complete absence of moisture, and the change that does take place is doubtless initiated by a trace of moisture already present." In further illustration of the inability of sulphuretted hydrogen to enter into chemical union unless a trace of moisture be present, he quotes experiments in which the dried gas was passed over dry acetate of lead paper for hours without the paper being in the least discoloured; while on moistening the paper, it was immediately blackened.

It would have been of great assistance and suggestiveness to me had I seen the above before carrying out the experiments of which the results are recorded in my article. It is, however, interesting to find so fully justified the suggestion I advanced on p. 634, that "the presence of hygroscopic water, if only in infinitesimal quantity, is required to promote the mutual reaction of sulphuretted hydrogen and oxide of iron." Light is also shed on what was perplexing to me in the behaviour of sulphuretted hydrogen with ferric oxide at 212° Fahr. As stated on p. 680, I found that, at this temperature, not only was there no gain, but, on the contrary, the absorptive power of the oxide was much reduced. For example, in one set of experiments, I found that 12·77 per cent. of sulphur was absorbed when the U-tube in which the absorption was made was in air at 68° Fahr., and only 1·78 per cent. when in a water-bath maintained at 212° Fahr. Mr. Hughes's researches prove that moisture is needed to start the reaction; and he concludes—judging from the results obtained by Richardson in his experiments on the combination of gases (already referred to)—that such needed moisture, to be effective, must exist in the form of liquid, and not as vapour. Guided by this light, I now explain the results I obtained as follows: The oxide was contained in one limb of a stoppered U-tube; the other limb containing calcium chloride. The U-tube was immersed in the water-bath for some time before being connected up to the source of sulphuretted hydrogen. The moisture originally contained in the oxide—some 6 per cent.—would probably, therefore, be, to a great extent, driven off, and absorbed by the calcium chloride, before the experiment really commenced; while the high temperature maintained during the experiment would raise such as remained, or was formed in the slight reaction that occurred, to the state of vapour.

We may therefore conclude that, in purifying gas by oxide of iron, with the aid of air, it is dangerous to allow the temperature of the material to rise so high as 200° Fahr.; but below this

* See JOURNAL, Vol. LX., p. 945. † *Ibid.*, Vol. XLVI., p. 826.

point, the higher the temperature, the more absorbent will be the oxide. Whether or not Mr. Dexter's method—the introduction of steam into the current of gas—is the best means that can be devised for averting the one and promoting the other, may well form the subject of extended experiment.

NOTES.

Shone Sewage Machines at Chicago.

It is reported that the largest Shone hydro-pneumatic sewage-disposal plant yet put down anywhere in America, if not the whole world, is that designed to deal with the sewage of the Chicago Exhibition. Whatever may be the condition of the city in this regard, it is intended to make the sewering of the exhibition buildings and grounds a model of what such work should be; and the Shone system will accordingly have a great opportunity for displaying its capabilities. A paper and discussion on the subject of this plant in connection with the exhibition appear in the Transactions of the American Society of Civil Engineers, from which it is to be gathered that no expense has been spared to make the experiment succeed, since no information is forthcoming as to the cost of the plant as a whole. There are 52 of the ejectors fixed, with a total capacity of 17 million gallons; and the air-compressing plant is put in as an exhibit. In the course of discussion, a sound criticism of the Shone sewage system was pronounced by Mr. Rudolf Hering, who described it as "nothing more" nor less than the application of a certain mechanical contrivance for lifting liquids. Having inspected the Chicago Exhibition plant, Mr. Hering stated as his impression of it that the Shone ejector has the advantage of greater simplicity over a reciprocating pump, while its sanitary efficiency is quite as satisfactory. He considers the Shone system mainly in the light of cost; and he appears to think that this is likely to become prohibitory in the case of large cities, while for special applications the system may be quite satisfactory.

The Use of Steam-Rollers on Roads.

The American Society of Engineers have recently discussed the subject of road construction, and have collected a number of opinions respecting the use of steam-rollers and other points in connection with making and preserving road surfaces. The great majority of these favour the steam-roller wherever there is enough work to make such an implement pay, on the general ground that it produces a better road at less cost and in less time than by horse rolling, and that steam-rolled roads are pleasanter for travel, cleaner, and more durable. Most of the engineers speak of using clean gravel or stone screenings to bind the broken stone; only employing clay for this purpose as a last resource. Upon the question of damage by steam-rollers to gas and water mains, &c., the general statement is made that no trouble is experienced on this score. One authority speaks of a few strained joints of gas-pipes near the surface, and when newly laid; and another reports: "No trouble, except when mains are less than 18 inches below surface." In such cases, the use of the roller has had to be abandoned. On the other hand, it came out that the hasty consolidation of roadways by the use of a heavy steam-roller is not the best way to make a durable road. During the discussion, reference was made to the costly roadway of the Victoria Embankment in London. This road is never disturbed for operations connected with gas and water supply; and it is frequently re-made by the aid of steam-picks, machine-broken stone, and numerous steam-rollers. It is, moreover, assiduously swept and watered; yet it is one of the worst roads in London.

Carbonate of Soda for Purifying Boiler Feed Water.

Dr. R. Jones recommends in the *Zeit. Angew. Chemie* the use of carbonate of soda as an anti-incrustator for boiler feed water. He describes an example of a boiler under his own supervision which is fed with water from the Elbe, treated by warming with carbonate of soda solution, and subsequent filtering through a press. The latter was an old one that had formerly been used for a different purpose; and for a warming vessel recourse was had to a small boiler for which there was no other use. The apparatus was put together by the firm's own workmen; the only cash expended being 12 marks (12s.) for a graduated cock for regulating the flow of the soda solution. This home-made apparatus works well; and it could be copied in any factory. The consumption of carbonate of soda amounts to 2·5 kilos a day; just so much of the solution being added to the feed water as will produce a distinct red colour with phenol-phthalein, a solution of which the boiler attendant has always ready at hand. An ordinary boiler man is quite able to master the process, which is claimed to keep the plates almost absolutely free from scale or deposit of any kind, no matter what degree of permanent hardness the feed water may show at starting. Dr. Jones cautions boiler users against supplementing the carbonate of soda with caustic soda or quicklime. Used alone, the carbonate does no harm, even if in excess, so long as the proportion is not unreasonable. In conclusion, Dr. Jones warns boiler users against "the many bogus anti-incrustator compounds which are continually being pressed upon the public under most seductive appellations." He describes these as being made only to sell, and as mostly either useless or positively harmful.

TECHNICAL RECORD.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

We have received from the Secretary of the above Institution (Mr. T. Cole) the programme for the general meeting, which, as already announced, will take place at the Institution of Civil Engineers on the 10th and 11th inst., under the presidency of Mr. John Methven, of Beckton.

The proceedings will open with the presentation of the annual report of the Council and the statement of accounts. (The former is given below.) New members will then be elected, and the report of the Scrutineers presented. The President's address will follow; and a proposition will be made with regard to students. There are three papers set down for reading and discussion on the first day: "Differential Rates for Gas," by Mr. George Livesey; "Carburetted Water Gas in England," by Professor Vivian B. Lewes; "Carburetted Water-Gas Apparatus: Its Present Status Briefly Outlined," by Mr. A. G. Glasgow. The following papers will be taken on the second day: "Notes on the Application of Oxygen to Lime Purification at Shrewsbury," by Mr. W. Belton; "The Application of Weldon Mud to Gas Purification," by Messrs. J. J. Hood and A. G. Salamon; "Inclined Retorts at the Coventry Gas-Works," by Mr. George Winstanley; "An Improved System of Working Inclined Retorts," by Mr. J. F. Braidwood; and "The Application of Machinery for Working Horizontal Retorts," by Mr. C. C. Carpenter. The annual dinner will be held at the Holborn Restaurant on the evening of the 10th; and on the 12th the members will visit the Beckton Gas-Works, and (on the invitation of the President) take a drive in Epping Forest.

Annual Report of the Council.

The Council, in presenting their third annual report to the members, has pleasure in again recording the steady growth of the Institution; 25 applications for admission having been made during the past year. The addition of this number will raise the total membership to 139—an evidence of progress which the Council consider eminently satisfactory. Several applications for admission as students have also been received by the Council.

Reference has already been made, in the volume of Transactions, to the death of Mr. John Somerville; but the Council desires to further express its appreciation of the great loss the Institution has sustained by his removal from their midst.

In accordance with the resolution passed at the last May meeting with reference to the proposed alteration in the standard of light, at that time under the consideration of a Committee appointed by the Board of Trade, the Council nominated Messrs. Hunt, Methven, and Paterson to lay its views before the above Committee. An interview was then arranged, at which, at the suggestion of the Standards Committee, they were joined by a deputation representing The Gas Institute, previous to which, in further compliance with the suggestion of the Standards Committee, your representatives met those appointed by The Gas Institute, who unanimously agreed to adopt the following resolutions, which had been already drafted by your Council:—

(1) That attention be drawn to Mr. Methven's experiments showing the influence of the hygrometric condition of the atmosphere upon the pentane unit of light; corrections for this source of error appearing to be necessary to enable the pentane candle to be used for standardizing.

(2) That air carburetted with pentane be used for testing purposes.

(3) That a multiple of the standard candle, equal to 10 candles, be produced for testing purposes, by the application of a screen to an Argand burner; and that all tests be performed with an open bar photometer (not less than) 60 inches in length.

(4) That the rate of consumption of the gas to be tested be adjusted, as nearly as practicable, to the maximum efficiency of the various standard burners.

Two further suggestions on the part of The Gas Institute—that (*a*) any proposed standard should have a relative value to the existing one, and that (*b*) the present obligations of gas suppliers should in no respect be injuriously affected—were accepted by your representatives.

At the interview, Mr. Hunt was called upon to state the views of the deputation; and a full explanation of all the points involved was given by him and the other members. Dr. Odling, the Chairman of the Committee, promised careful consideration for the views which were submitted, and thanked the deputation for their suggestions. As no report has yet been issued by the Standards Committee, your Council is unable to state the result of their action in this matter.

The second volume of Transactions has been duly issued. The Council is glad to record that the suggestion made in their report last year has been received with favour; several members having contributed valuable papers and drawings, illustrating various constructional works, as well as other matters of interest. These, together with the abstracts from scientific

Journals, the Council believes will form a valuable addition to the Transactions.

The success which attended the autumn meeting at Birmingham and Coventry leads the Council to hope that similar meetings will be held in the future; thus affording the members additional opportunity of interchanging ideas, as well as of visiting works of importance and technical interest.

With the view of extending the usefulness of the Institution, the Council will bring forward, at the forthcoming meeting, a proposal having reference to the privileges of students.

The Council has transferred Mr. A. E. Broadberry (associate) to the class of members.

CHARLES HUNT, President.
THOMAS COLE, Secretary.

May, 1893.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Thirty-second Half-Yearly Meeting of the North of England Gas Managers' Association was held last Saturday, in the Offices of the Newcastle and Gateshead Gas Company. When the President (Mr. J. Whyte, Manager of the Seaham Harbour Gas Company) took the chair, there was a large turn-out of members, many of whom had travelled long distances. Some formal business was first transacted.

THE PROPOSED FEDERATION OF GAS ASSOCIATIONS.

The PRESIDENT said the following letter upon the proposal for a federation of English Gas Managers' Associations had been received:—

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS,
Salisbury, April 13, 1893.

Dear Sir,—At the meeting of this Association, held on the 11th inst., the resolutions annexed were unanimously carried; and the President, Mr. Irving, and myself were appointed as representatives. Kindly bring the matter before your Association at the earliest opportunity, and let me know the result.

N. H. HUMPHRYS, Hon. Secretary.

The SECRETARY (Mr. W. Hardie, of Newcastle) read the enclosed resolutions, which will be found in Mr. Irving's remarks on the subject at the recent meeting of the South-West Association, as reported in the JOURNAL for the 18th ult.

Mr. J. HEPWORTH (Carlisle) said he thoroughly endorsed the views that were expressed in the resolutions; but he thought the subject was one which the Committee should have considered before bringing it up.

The PRESIDENT pointed out that the letter was dated April 13; and he explained that there had not been a meeting of the Committee since it was received.

Mr. T. BOWER (West Hartlepool) said he was of opinion that the matter was one which required very careful consideration; and he proposed that the letter and resolutions be referred to the Committee, with power to answer the letter on behalf of the Association in the manner they thought most expedient.

Mr. W. AIRTH (Morpeth) seconded the motion, which was agreed to.

INTRODUCTORY REMARKS BY THE PRESIDENT.

The PRESIDENT, addressing the members, said: In opening this meeting for the disposal of the business before us, I must express my pleasure at seeing such a company as we have here to-day. During the past year we have again been reminded of the changefulness of all earthly associations; our ranks having been broken by the rude hand of Death. I refer to the loss of our fellow-member Mr. Burns, of Sunderland, who retired only a few months ago, by reason of his declining years, to enjoy, as we all hoped, the well-earned rest and reward of long faithful service; but it was otherwise ordered. Though it is not usual to give an address from the chair at our annual meeting—a custom from which I will certainly not depart—I may be expected to say something in regard to our present and future outlook. As for the present, we certainly have a clearer atmosphere than we have had for the past year or two. Coal, which has so long been at famine prices, has now reached a figure which I think can hardly be regarded as unreasonable, when we come to consider the various items that go to make up its cost. As a proof of the change in prices, I may mention that a colliery manager informed me some weeks ago that a contract his company had for 40,000 tons of coal had just expired, and they were asked to renew it at exactly one-half the rate, or 5s. 9d. per ton—a proposition which, I may say, was declined with thanks. Tar, which about twenty-five years ago, (according to Mr. Perkin) was said to contain some fifty different substances, may to-day be put down as having nearly four times fifty; and still fresh discoveries are being made. Yet the price of tar continues very low indeed. I venture to predict that it will be utilized to greater advantage in the future than it has yet been. Let us hope that the present slight improvement in value is only as the "early drops of the coming rain." Sulphate of ammonia has certainly risen very considerably in price of late; and I am sure I only echo your sentiments when I express the hope that it may long continue, so that both gas and chemical companies may recoup themselves for the long period of depression they have passed through. The labour market, so far as gas-works are concerned, is comparatively quiet; but when we look around generally, it almost seems that this is the painful stillness that precedes the dreadful storm. During the past year, a great advance has been made in the manufacture of gas. The *modus operandi* adopted in the Peebles works for gasifying oil (and tar also, if I am not mistaken) has passed the experimental stage, is now an accomplished fact, and only wants time for development. The other process—and one with which we are deeply concerned—is the Yeadon, which I will not attempt to describe, as we are to have a paper upon it from our friend Mr. Terrace, in whose practical hands it is quite safe. I will not therefore try to forecast the result of his experiments. I thank you for your kindness in bearing with my shortcomings since you elected me to this honourable position, and still crave your help to make our present meeting both pleasant and profitable.

READING OF PAPERS.

Mr. D. TERRACE (Middlesbrough) then read the following paper:—

A DESCRIPTION OF THE YEADON ROTARY SYSTEM OF GAS MAKING.

Notwithstanding the many inventions intended to alleviate the lot of the gas stoker, and at the same time be made to pay their way in the working of our raw material—coal—there does not appear to be any one that may be said to be of universal, or even general, application. In several large works, stoking machinery has been introduced; but there are many similar works where one would suppose the conditions were equally favourable, but the managers of which appear to be holding back, I opine, till the perfect machine is invented, or, it may be, to note the fate of the later developments—inclined retorts, or other systems. I am of opinion that it depends greatly upon the treatment the various stoking devices receive at the hands of those working them, whether they turn out a success or otherwise; and, if so, one need not be surprised at the apparent hesitancy we note all round. What we should first of all determine is: Is the principle of the machine or other appliance sound? If satisfied on this point, then I should say adopt it, and make certain that it is fairly worked out in its every detail. Steam or other power is bound in time to take the place of arduous hand labour; and I venture to assert that we would all hail the advent of any machine or system that would meet our requirements.

To-day we are to consider the latest invention in the direction of automatic carbonization—viz., the Yeadon revolving retort, in which we have some novel features presented.* The retort, about 7 feet of which is exposed to the fire, is conical in form, and is made of cast iron; revolving, on a horizontal axis, about three turns per minute. The diameter of the heated part is about 2 ft. 6 in. at the feeding end, and 3 ft. 6 in. at the discharging end. Cast solid with the retort are four feathers, which, in revolving, constantly keep the coals stirred. An external ring rib is cast on, to strengthen the body of the retort which is exposed to heat. There are stuffing-boxes with asbestos packing in the stationary part at either end. Means are also taken to prevent in-draught of air into the furnace, by having segmental strips of iron close to the revolving retort. Plain rollers, revolving in water-trough castings, support the retort at the feeding end; while at the discharging end the rollers are V-shape, to keep the retort in its position longitudinally—the expansion caused by the heating taking place at the feeding end, where provision is also made in the driving-pinion being more than double the width of the wheel attached to the retort. The stuffing-box at the feeding end is also elongated, to allow of expansion; and jets of water play on the packing, for cooling and lubrication. At the feeding end is a hopper, kept constantly full of the coal, which in turn is forced into the smaller end of the retort by blades fixed spirally on the shaft. The coal drops from the end of the pipe into the retort, which, being conical and revolving (with internal feathers), is made to travel automatically to the larger end, where the cinder falls into a recess, from which it is discharged by similar spiral blades. The coal can be automatically fed by conveyors into the hopper; and the cinder may be taken away by similar conveyors. A small engine (about 1-horse power) drives a shaft on which are a pair of bevel wheels, which communicate motion to a longitudinal shaft parallel to the retort. On this shaft are two pinions gearing into large wheels—one fixed near either end of the retort. On the first motion is a pulley on a countershaft, with a cone driving another with a worm and wheel on the shaft, with spiral blades feeding the coal into the retort. At the larger end, the longitudinal shaft, by means of bevel gearing, drives the discharging spiral blades. The elevators and conveyors can also be driven from the same range of shafting. There may be one or more retorts set in a bed, and heated by an ordinary furnace or by regenerative firing, as may be found most convenient. The gas produced is taken off at the larger end of the retort by the usual exhauster arrangements; the vacuum inside the retort being regulated, so as to prevent the possible escape of gas or in-draught of air. The closely-packed coal at the

* The various modifications of this apparatus have been, from time to time, illustrated in our pages—in the "Register of Patents." The drawings exhibited in connection with Mr. Terrace's paper were similar to those shown in our issue of Dec. 13 last, p. 1042. The original patent was No. 19,183 of 1889; and a further modification was shown in last week's JOURNAL, p. 732.

charging end, and the similar tightness of the cinder, keeps the retort practically closed, if there be not too great variation caused in the range of vacuum by the exhauster.

One of the chief merits of this system is that the coal, being constantly kept in motion by the revolving action of the retort, is made to give up its gases in a very short time (some twelve minutes being sufficient), instead of, as at present, extracting the gas, &c., by first spreading the coal in layers, and subjecting the inert masses to heat for six hours. Another advantage of keeping the coal in motion is that this form of retort is particularly adapted for carbonizing the very smallest, and consequently the cheapest coals, which many works reject at present as being unsuitable for the purpose of gas making with the ordinary retorts. It also appears that, in the Yeadon retort, not only is the gas, in the ordinary sense, obtained, but the tarry and other matters, which we find in our liquor-wells, are also converted into useful gas, and this of a higher illuminating value. As an evidence of this, it may be stated that, from experiments which have been made, some 2000 cubic feet of gas per ton more in quantity, and 2-candle power increase in quality, have been evolved.

By thus volatilizing at one process all the available illuminants, you will be prepared to learn that the remaining tar, &c., is of decreased value. But not only is this the case with the liquid matters, but the solid residue, or cinder, is also useless as coke. (It appears, however, that other uses are being found for it.) So that there is a *total* destructive distillation of the coal in this mode of carbonizing. We have thus a new set of commercial conditions set up.

It will naturally be asked: "What relationship is there between the gain in sperm value and the loss from the non-production of coke, and the values usually obtained in present working? We should, however, first take notice of the question of labour, which is practically all, or nearly all, accomplished by the machinery, the mere attendance on which may be said to be all that is necessary—the hard manual labour being dispensed with, except for keeping up the heats, and for this it is proposed that gaseous firing would be introduced. On the other hand, there is the first cost of the machinery, and also the wear and tear, to be taken into account. But when it is considered that a revolving retort is capable of producing five to seven times the quantity of gas from a greatly less consumption of fuel in the furnace, and that it occupies less ground-space, it will be conceded that there may be even less expense under this head than at present.

As the retort has only been working experimentally, at frequent intervals, during the past two years and a half, and as it is not now so capable, on this account, of being worked to the same advantage, we do not have exact working data; but the following may perhaps be taken as a sufficiently near estimate of the difference of cost per ton, comparing the present working with the revolving retort:—

		Per Ton.
Gain.—In using the smaller kinds of gas-producing coal		1s. 6d.
In labour—		
Carbonizing at present costs	3s. 0d.	
Say, for revolving retort	1 0	
		2 0
2000 cubic feet of gas (say) at 2s.		4 0
2-candle power beyond 16 candles (say) at 3d.		0 6
Total gain		8 0
Loss.—Coke (say) 8½ cwt. at 6d.	4s. 3d.	
Difference of tar, &c., values	0 9	
		5 0
Balance in favour of revolving retort		3 0

This statement would necessarily vary in different works, and such allowances could be made on the items mentioned.

As to the other advantages of the retort in question, it may be thought that the want of coke production is in the reverse ratio; but doubtless—if one may judge by recent experiences—it would have been a good riddance to be clear of a large proportion of the coke made by the ordinary means, as thousands of tons have been stocked at great expense, and after all a very low price per ton had to be taken for it. Tar and liquor, too, have been a drug in the market for some years. A restriction in their production might have a beneficial effect on our getting something like the intrinsic value—if such a term can be applied in that sense—instead of only about one-third of that.

Generally, the result of the adoption of such a retort as described, would be that about half the quantity of gas (say) during the winter season could be made on this principle. This might involve that another class of labour for carbonizing would be employed in the busy season—leaving the regular hands practically undisturbed all the year round, or *vice versâ*. Supposing a good stock of coke were remaining in the spring, the revolving retorts may be kept going, or otherwise, as the circumstances of labour, &c., may determine. In a word, it would put us in possession of the proverbial "two strings" to our "bow;" and, in our particular case, this other string has long been a "felt want" in these later days.

There is yet another phase in which we ought to look favourably on this invention. I refer to its applicability for re-burning spent gas lime.* A retort that could at pleasure be made to either manufacture great quantities of gas, or turn to a useful purpose that which is so much waste, would be a very great boon in many works. It is well known that lime can be re-burned; and it has only been for want of the means whereby this could be readily accomplished, which has deprived many managers from devoting special plant to the purpose. The revolving retort would thus be a very economic appliance; and we await with confident expectation its being fully adapted and further tested in our interests. Its future development will be eagerly looked forward to; and machines should now be put in practical operation at various gas-works, where all the details of working—both for coal and spent lime—would be carefully noted, to guide those who may apply the system as a permanent installation.

* The special arrangement for this purpose was described and illustrated in the JOURNAL for March 7 last, p. 411.

Discussion.

Mr. W. FORD (Stockton) said they had all listened with pleasure to Mr. Terrace's paper. It had been short and to the purpose. He thought the author had not missed a point in favour of this apparatus; but one's mind could see a very considerable number of objections that Mr. Terrace had not touched upon. He must confess that, when he went to see the apparatus, he went with a mind prejudiced against its likelihood of ever being introduced as an element of success in gas manufacture. But, from further experience in the examination of the appliance, he had come to believe that there was something in it; and it only remained, in his opinion, to confirm what Mr. Terrace had said in his paper—that there should be a practical application of it in some gas-works, under practical gas management. The experiments which had been made were, no doubt, very good; but an apparatus of this description, when it was put to every-day work, would be either of great advantagie to them, or it would be thrown on the scrap-heap, as, in his experience, so many of the inventions that had been brought before them during the last 35 years had been. Some of those had gone to their own account, without having left any result; but in this apparatus he saw a future, provided the practical objections which in his eyes remained could be removed. He might say that, like Mr. Terrace, he had had the advantage of seeing the appliance at work; and one thing which struck him against its introduction was the question whether it could be demonstrated in practice that it could be worked continuously. He must hesitate in believing that this had yet been demonstrated. The fact of its being worked at intervals was in favour of the process; but it had yet to be shown that it was capable of running the seven days of the week, granting even that a small space of time were allowed each day to recoup, because they must understand that the coal was going in continuously, and there was no rest. It was always green coal that was running in; and they all knew what was the effect of putting coal into a retort, with reference to the heat. There was one advantage of this process, and it was that they could "lay it off" on the Saturday night, and come back an hour or two earlier on the Monday morning and start it again. This was a great advantage, because, as all present were aware, the troubles with their men arose with those who came in for three or four months in the winter. The steady old stoker they had all the year round was not inclined to agitate; while the other man only wanted all he could get out of them for the two or three months' work he gave. The machine looked complicated; but he must say that any gentleman who saw it at work would come to the same opinion that he did—that it was much simpler than it appeared on paper. Taking it for granted that the coal was to be a gas-producing coal, he was at one with Mr. Terrace in his statement that they might save 1s. 6d. per ton. There was no doubt that the smaller the coal the better this apparatus would work it. There was with it none of that great heat and labour which they had even in stoking-machines. He did not think the heat was quite done away with in those machines. It might be that the inclined retort system would be of much advantage in that way. Of this he had had no experience; but they hoped to hear before long Mr. Terrace's views on the subject. There was, he thought, not the slightest doubt that the loss of tar would not be to their advantage. He believed that for the tar destructively distilled in this process, they did not have the proper proportion in value either of gas or illuminant. This might be accounted for to some extent by the state of the retort as they found it. It was very old—two years and a half; and they all knew (at least the older members did, who had had experience in the working of iron retorts) that when they once began to give way they were very difficult to patch up. This was a matter that would be easily overcome; and the very fact of this retort having been heated up 50 or 60 times a year showed there must be something in it. With it, they could start to make gas in a few hours. Suppose a London fog came on, what a great advantage this apparatus would be to a London Gas Company if they had 100 or so of them in reserve. Fancy the quantity of gas that could be evolved from this retort in a few hours! It was capable of doing the work of 28 ordinary retorts; and they knew the time it took to light up 28 retorts by the usual process. The fog might come and go again before they were ready for work; but with this apparatus they would have the gas generated and sent into the holder in a few hours' time. There was really no mechanical difficulty that he could see in the process; and all he wished was that it should be adopted in some gas-works, and put to practical work during the coming season.

Mr. T. BOWER (West Hartlepool) said he went to Leeds with

Mr. Ford and Mr. Terrace, to see the invention they had heard described. When he saw the apparatus at work, his first impression was that there was something very novel in it, and something, as he thought, which was a decided improvement upon anything hitherto introduced. But, on further investigation, several things occurred to him which it might not be desirable to adopt. He believed, however, it was the intention of the patentees to make considerable improvements in the apparatus. One point which struck him was that which Mr. Terrace had mentioned, as to the admission of air into the retort. Means were, he believed, to be taken to mitigate this as much as possible; but it seemed to him that, in those openings, they had a source of evil which might be very serious, and which, if not very carefully kept in check, might seriously affect the results. He agreed with Mr. Ford as to the working of the apparatus. One of the greatest advantages of the retort was its being capable of being started on [very short notice, for temporary purposes such as fog. When he reached home, he carefully thought over the matter, and began to work out some results, and to compare them with those which he was getting by the ordinary process; and he was free to confess that he underwent a further conversion in the matter. Mr. Terrace had quoted some figures which, he was quite sure, were given with the best intention; and, he had no doubt, they were based on facts he had before him. He first of all gave them a saving of 1s. 6d. per ton of coal, by reason of their being able to use small coal. Many of the members would bear him out, he thought, that the average difference in cost between screened and unscreened coal, generally speaking, was something like 1s. per ton. This being so, those of them who were in the habit of using all screened coal, if they could by the introduction of this retort use unscreened coal, might possibly save more than 1s. per ton. In his own case, where the bulk of the coal they carbonized was unscreened, he failed to see that he would get even this saving; and how the 1s. 6d. came in was not very clear. He might, however, be told that they would be able to use an inferior class of coal. Well, if this were so, necessarily the results they would obtain would be inferior to those realized with a good class of coal. He also thought that a saving of 3s. per ton upon labour was rather high, judging from his own results.

Mr. Terrace pointed out that his statement was 2s. per ton.

Mr. Bower said the saving would vary very materially according to the rate which was paid for labour. If they had a high rate, the saving must necessarily be very much greater than where they had stokers' wages down to 4s. per day. But the item to which he took most exception was that of the additional 2000 cubic feet of gas at 2s. per 1000 cubic feet. What seemed to him to be rather contrary with regard to this was that Mr. Terrace was in the happy position of being able to sell gas at 2s. per 1000 cubic feet; and if he were only getting 2000 cubic feet extra, at 2s., how was he to recover the cost of distribution, the contribution to the sinking fund, and the profits which he so generously handed over to the borough funds for other purposes? If he were only to obtain a saving of 2s. per 1000 cubic feet into the gasholder, it seemed to him that the figure was altogether too high to make a comparison of that sort. For his own part, he should have put it at half the amount, because he was afraid that, if all the gas produced in the North of England cost 1s. per 1000 cubic feet into the gasholder at all times, dividends would be very scarce. As to the use of the apparatus for spent lime, he decidedly thought there was something in the future for the appliance for that purpose. It appeared to him that it was particularly suited for revivifying spent lime; and if he should, at any future time, ever be induced to look into the matter with a view to experiment, he should think this would be one of the greatest factors that would influence him to introduce it, rather than to adopt it, in the first instance, for the distillation of coal. There were several other matters Mr. Terrace had touched upon and given an able explanation of; but it seemed to him, as Mr. Ford had said, from the fact that the results were obtained during a process of carbonization extending over (say) not more than 30 minutes, that they might be very different from what would be realized if the plant had to work for 24 hours or for a week. This was a point which could only be settled by some gas manager getting the plant introduced into his own works, and giving it a fair trial under the usual conditions; and he was in hopes that some of their friends—perhaps Mr. Terrace or Mr. Ford—would, if they were so sanguine of the results, before long introduce it in their works, and give their brethren the benefit of their experience.

Mr. J. Hepworth was sure the Association would be the first to welcome any efforts that were made with a view to reducing the cost of labour in gas-works, or ameliorating the conditions which existed with reference to the labour attached to the operation of stoking. He had listened very carefully to Mr. Terrace's paper; and he thought there were some striking omissions, although it contained a great many facts and statements which were extremely interesting, but which were open to very much criticism. He did not hear any reference made to the cost of the installation itself. The first cost was a primary matter to consider when they came to make deductions as to the saving to be obtained by the introduction of the process. He dissented—in a friendly manner, of course—from some of the statements which were made in the paper as to the saving, in the first place, upon the cost of coal. He should think it quite possible that 1s. 6d. or 1s. might very well be saved. But, if he understood the apparatus aright, they would be compelled to use small coal. If they had coal which contained large nodules, they would be obliged to separate these larger pieces, and, to do this, they must either commence screening, or have a grinding process for reducing the coal to one size. The outlay for this would have to go against the 1s. 6d. or 1s. saved in the first cost of the coal. Then he did not agree with the figures given as to the cost of increasing the value of the gas. It was claimed in the paper that the quality of the gas was enriched to the extent of something like two candles; and Mr. Terrace had stated that about 3d. per candle would be the cost by the ordinary process. Well, he had to enrich gas; but he would not say that it cost him 3d. per candle. A less figure than that should be taken. He was a little dubious about the 2000 cubic feet extra per ton of coal, though he was sure that anything which Mr. Terrace told them would be quite substantiated by his own experience. The sources of damage by the introduction of air had already been pointed out; and one was glad to hear that means were to be taken to prevent such a serious matter. With reference to the continuous working of a retort like this, there would be some danger in having to let down the heat, because of the delicate joints. The apparatus could never be thoroughly tested until it was put into a gas-works, and operated continuously during the six or seven days of a week. If this were done, the figures which had been given them would have to undergo very considerable revision. With reference to the use of the apparatus for revivifying spent lime, it seemed to him that it would be excellent for the purpose; but, unless it could be done by this process very much cheaper than by other processes, he did not know that it would be of much value. Where they could get lime at 10s. per ton, the apparatus must be a very effective and very cheap one to pay interest on capital, and for the labour involved in revivifying a cheap material like that.

Mr. W. J. Warner (South Shields) thought it was due to Mr. Terrace that he should, on behalf of the Committee, say one word with reference to the data that gentleman had submitted that day. It was the author's desire to have fuller and more reliable data to put before them; and to some little extent he hesitated in presenting the paper without data more satisfactory than those he had had to rely upon. But the Committee pressed him to bring the paper before the Association. He had done his best; and he (Mr. Warner) considered they could not do otherwise than admit that the result had been satisfactory.

Mr. Sayer (Harrogate) said that, having heard the paper and seen some of the experiments conducted with the apparatus, he would just add his testimony that he thought those who had not had the pleasure of investigating the process would find it was somewhat of an "eye-opener" to them, although it was in a form in which the results could scarcely be taken as what would be obtained in practical working. But even in the form in which it was, it was a very decided advance in the distillation of coal.

Mr. B. W. Richardson (Harrogate) asked what quantity of residual cinders was obtained per ton of coal.

Mr. C. D. Drury (Sunderland) remarked that he had not seen the retort, and would like to put a few questions. One was at what temperature the apparatus worked, and also as to the probable life of it. He also wished to know what amount of the area of the retort was occupied by the charge, because, unless the area were pretty well occupied, he should imagine that stopped pipes would frequently occur. From what he had heard, he supposed that Mr. Terrace would not recommend an installation of these retorts by themselves, but only as an auxiliary to the ordinary retorts.

Mr. Terrace, replying to the points raised in the discussion, said Mr. Ford had stated some practical objections which he saw; but these were necessarily details, which would be rectified in future apparatus. There was no doubt the appliance was not perfect. As to continuous use, it was a question as to whether it would be better to be always working. He thought, indeed, that a retort was always best when it was continuously in operation. This retort had been working, not for 30 minutes, but for 16 hours at a stretch. The gas was given off by it in 12½ minutes; but they had never had a test which lasted less than two hours. It was a question of heats whether the coal would all require to be of one size. It was impossible to tell by a single retort, exposed to wind and rain; and it would be too bad to throttle an invention of this kind by a single instance. But, if sufficient heat were applied, he thought they could look for the results. The trend of his paper was that the retort would be an auxiliary; and the figures he gave were tentative. The saving of 3s. which Mr. Bower commented upon was the total gain, of which 1s. was from labour. They would not have any outlay upon the 2000 cubic feet of gas they gained out of the same coal. He thought that the main thing was to get the 2000 cubic feet, and that they would all be very pleased to have it. The cost at the holders was a question which, in his opinion, they need scarcely mix up with this one; it was carbonization they had to do with. Of course, Mr. Bower was quite right in saying that the 2s. for the 2000 cubic feet was not all gain. As to screened and unscreened coal, what he alluded to was not unscreened coal at all; it was "duff" coal—small coal. He referred to the small coal, but not necessarily inferior coal, though coal which there was difficulty at present in carbonizing. Mr. Hepworth made some reference to the cost of the apparatus. This, he believed, would be something like £600, or

about equivalent to the cost of a through bed of retorts. He merely mentioned the matter in a very tentative way in his paper, because he did not pretend to go into many particulars. Mr. Hepworth also alluded to the grinding of the coal. Of course, this would require to be done, because the spiral would not deal with large lumps; but it was necessary to do this for ordinary stoking-machines. The temperature at which the retort was used was just what they would expect an iron retort to be worked at—perhaps up to 1500°. They had to heat according to the material they were carbonizing. When they were passing coal continuously through it, they could easily regulate the heat. The area of the charge would simply be greater or less according to the heat they had externally. There was about the same weight of cinders—about 8 cwt. per ton, although, as he said, they were useless, and therefore he took no notice of them.

The PRESIDENT said he confessed he could not see himself where the 1s. 6d. per ton might be saved by using either "duff" or the single screened coal, which would be suitable for this apparatus. He was sure they all felt very much obliged to Mr. Terrace for his kindness, and would give him a warm vote of thanks for his trouble.

The proposal was heartily agreed to.

MR. G. R. HISLOP'S PATENT RETORT-SETTINGS.

Mr. H. LEES (Hexham) read a paper on the above subject, prepared by Mr. Er W. Smith, of Cockermouth, who was unable to be present. This will be published next week.

At the close of the communication,

The PRESIDENT said he was very anxious that the paper should be read, because he knew that several of the members were "halting between two opinions"—the question being what system they were to adopt; and he thought that, if the question dealt with in the paper came before them, it might help them to arrive at a decision as to what to do.

Mr. HEPWORTH suggested that, as the time at disposal was nearly up, and as Mr. Smith would probably be present at the next meeting, it might be advisable to postpone the discussion upon the paper till then. He moved accordingly.

Mr. J. HALL (West Pelton) seconded the proposal, which was agreed to.

NEW MEMBERS.

Mr. Sayer, of Harrogate, was then elected a member of the Association; and Mr. Herbert Kindler, of Stockton, an Associate.

ELECTION OF OFFICE-BEARERS.

It was intimated that the following gentlemen had been elected to hold office in the ensuing year:—

President—Mr. D. Terrace, of Middlesbrough.

Vice-President—Colonel Sadler, of Middlesbrough.

Auditor—Mr. J. H. Penney, of South Shields.

Secretary and Treasurer—Mr. W. Hardie, of Newcastle.

Committee—Mr. H. Tobey, of Malton; Mr. H. Lees, of Hexham; Mr. J. Nichols, of Darlington; and Mr. J. Whyte, of Seaham.

Mr. TERRACE thanked the members for electing him President, and assured them that, with the assistance of Colonel Sadler, who was also an Alderman of Middlesbrough, he would do his best to give the members a hearty welcome when they met in that town in the autumn.

A VOTE OF THANKS.

On the motion of Mr. HEPWORTH, seconded by Mr. WARNER, a vote of thanks was passed to Mr. Whyte for his services as President.

The PRESIDENT, in returning thanks, said that, though he was reluctant to accept the presidency when it was offered to him, he did not regret the step he took, because of the kindness which had been shown to him.

This concluded the business; and the members afterwards dined together in the County Hotel.

Southern District Association of Gas Engineers and Managers.—The Committee of this Association have considered it advisable to hold the spring meeting on the 25th inst., instead of, as usual, on the second Thursday in the month.

Benzol Extraction.—Herr Heinzerling, of Frankfort-on-the Main, adds another to the innumerable schemes for extracting the benzol from coal and oil gas. He proposes to compress the gas in the presence of a strongly-cooled solution of some neutral salt, on the surface of which the benzol is said to separate as a buttery mass. Further quantities of solution are cooled by the expanding gas; so that the energy expended in compressing it is partially recovered.

Reduction in the Price of Coal.—Last Wednesday, an announcement appeared that an important reduction in coal prices was being made to Midland and Staffordshire gas companies, owing to the London Gas Companies having gone for their entire supplies to the Durham and Northumberland collieries. The Midland coalowners are competing severely for the orders of the companies in their district. First-class coal contracts, twelve months forward, are, it is stated, being arranged at 5s. 6d. to 6s. 6d. per ton—a remarkable drop of 1s. 6d. on the year.

REGISTER OF PATENTS.

Motors for Gas or Liquid Hydrocarbons.—Owen, E. T., of Millwall, E. No. 6240; March 31, 1892.

The object of this invention is to produce a motor capable of being operated by either gas, kerosene oil, or other liquid hydrocarbons capable of forming an explosive mixture. The motor can be actuated by either the one or the other, without necessitating any material alteration in the construction of the engine and fittings when a change of the explosive agent is made—*e.g.*, when one of these engines has been running with gas, the only alteration necessary to change from gas to liquid hydrocarbons is to disconnect the gas-fittings from the main, and connect the engine inlet to a pipe from an oil-tank, and light the lamp for the igniting apparatus.

The features of novelty in the invention may be summarized as follows: (1) In internal combustion engines, operated by explosive fluid mixtures, a cylinder so constructed that the piston shall only have a bearing at the forward end, in such a manner that the pressure shall not be allowed to escape. The remaining portion of the cylinder is formed into a clearance space, so that it may be heated without affecting the lubrication and operation of the piston, and to obviate in some cases the necessity of a water jacket. (2) The passage formed on or in the walls of the cylinder for forming the explosive mixture of vapour and air. (3) The construction and arrangement at the inlet end of the passage of a suitable spraying and air-mixing arrangement, so constructed as to allow of the proportions of either air or oil being varied. (4) The construction and arrangement of a governing attachment, consisting of a revolving piston-valve, operated by the centrifugal force of weights acting against a spring capable of adjustment. (5) The construction and arrangement of an air-pump, to give a "scavenger" charge from the front to the back end of the cylinder. (6) Ignition apparatus, consisting of a chamber closed at each end alternately by valves; one of the valves being provided with a mass of heated material, and both being opened and closed by an arrangement of cams, toggle-joints, and levers. (7) The construction and arrangement of an engine for explosive fluid mixtures, capable of being operated by either gas or oil, &c., without any material change of construction being necessary, and doing away with a separate vaporizing attachment; the heat of both explosion and exhaust being used for vaporizing the liquid hydrocarbon used.

Utilizing Gas for Warming or Heating Purposes.—Rylands, D., of Stanfoot, Yorks. No. 6733; April 8, 1892.

For placing in the fire-grate of a room, the patentee proposes to use pieces of fire-brick, made so as to allow through a portion of them passages for air and gas. These are so arranged, that the air which is forced through the fire-brick has a chance of being thoroughly heated before it comes in contact with the gas. Near to the fire-place there is fixed a blower, to force air through the heated fire-brick, and bring it at the right point in combination with the gas, so as to secure intense heat. Enough space is allowed in the fire-brick for the due expansion of the heated gases, so that the greatest amount of heat practically possible can be secured from the burning gases. In applying the invention to cooking apparatus, there would be placed in the apparatus an air-pipe and connecting-pipe, for driving in the air to get heat; and these would be so connected with the blower that a sufficient amount of hot air could be sent in along with the gas to economize the quantity of gas required. In large establishments, there would be one large blower in the basement, driven in any suitable manner; and in this case, the air would be conducted to each fire-place in the house by means of suitable pipes, so that it would be only necessary in lighting a fire to turn on the air at the same time as the gas.

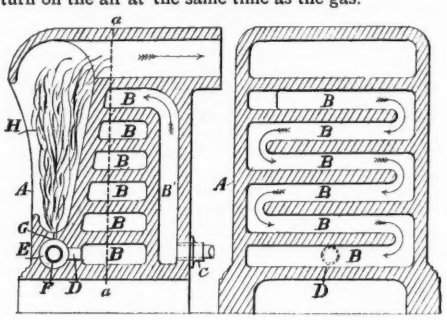


Fig. 1

Fig 2

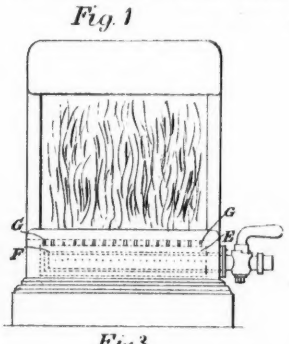


Fig 3

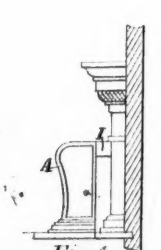


Fig 4

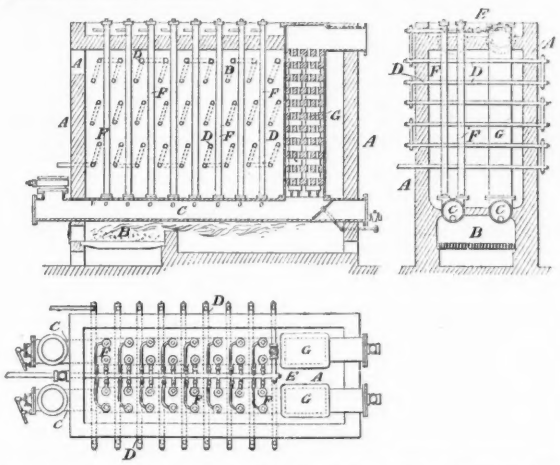
In figs. 1 and 2 (the latter being a section on the line *a a* in fig. 1), A is an open stove of fire-brick or other refractory material; B, a passage or port formed in the interior of the fixture, whereby the

incoming cold air supply is brought to a high temperature before mixing with the gas supply, by reason of the great amount of heating surface presented by the convulated containing walls of the port; and C, the air-supply pipe conveying air under slight pressure from a blower, fan, or air-compressor, to the inlet portion B^1 of the port B. Thence it passes in a right and left and downward direction, as shown by the arrows in fig. 2, till, passing through the port D, it enters the mixing-chamber E. Here, combining with the gas escaping from the perforations in the gas-supply pipe F, the now inflammable mixture leaves the chamber through the perforations G. It ignites in the open-fronted combustion chamber H, producing "intense heat and perfect combustion, as a result of the application of heated air to mix and combine with the gaseous fuel."

The stove, being self-contained, can be placed in any position in the room to be warmed. A ready means of connecting it to a register grate is shown by fig. 4, where the spent heat passes away through the outcast-flue I to the flue of the chimney.

Manufacture of Gas for Illuminating or Heating Purposes (applicable also for the Distillation of Liquid Hydrocarbons).—Dvorkovitz, P., of Highgate. No. 7983; April 27, 1892.

This invention has for its object to provide apparatus in which gas for illuminating or heating purposes can be produced from water gas and petroleum, or other liquid or liquefiable hydrocarbon—such as is referred to in patent No. 13,506 of 1891 as "oil-water gas." A further object of the invention is to cause the tar and products carried thereby to be in great part deposited before the gases or vapours reach the fixing-chambers; the arrangement being such that the tar can be readily removed, and the parts wherein the tar and products are deposited be easily cleaned.



The illustration shows the needful apparatus for this purpose (two sets in one heating chamber) in plan and longitudinal and transverse section.

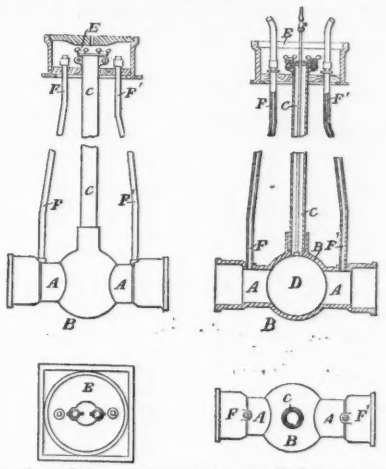
A is the heating chamber; and B is the furnace, having a roof extending from the front, but leaving an opening at the end farthest from the furnace, so that the hot gases may pass into A on their way to the chimney. C are tubes set in the roof of the furnace, and extending through, and projecting from each end of the chamber. At intervals throughout A, tubes D are mounted which extend to outside the chamber, and are connected so as to form a continuous passage for the oil. The end tube of the series is in communication with a pipe E, from which branch-pipes open into tubes F, which descend through the chamber A and open into the tubes C. The farther ends of each tube communicate with a fixing-chamber G, filled with fire-bricks or other material presenting an extended surface for the contact of the gases. The tube E is provided with a tube by which superheated steam can be admitted when desired.

When the apparatus is in use for enriching water gas with oil gas, the valves on the pipe for the inlet of water gas are opened; and oil is admitted, and passes along, and becomes heated in the tubes D. Thence the oil vapours flow into the tube E, and thence into the tubes F, wherein the tar separates, and passes down the tubes F, and deposits in the tubes C. The oil vapours meet the water gas, and pass with it through the fixing-chambers G, wherefrom any remaining tar which may deposit passes down into the tubes C—the combined water gas and oil gas passing off to the place of utilization or storeage.

If the water gas be omitted, the apparatus will make fixed gas from oil alone. If the apparatus is used simply for distilling oil, the valves for admitting water gas are closed, and the oil admitted. Superheated steam is then allowed to meet the vaporized oil in the pipe E, and assist the distillation. The tar deposits in the tube C; and the vaporized oil and steam pass out at the openings provided for the purpose, and the oil distilled is condensed and separated in any convenient apparatus for the purpose. The temperature will, of course, be lower where distillation only is to be effected than it will be when the oil is to be converted into a fixed gas. The fixing-chambers G, in distilling, act as continuations of the heating arrangement by which the gas is vaporized. By closing the cocks on the pipes which communicate with the pipes F (in connection with one of the tubes C), the pipes F can be cleaned, by removing the stoppers at their upper ends, while the process is carried on in the other half of the apparatus.

Applying Gas-Bags to Gas-Mains.—Milne, J., of Edinburgh; communicated from E. F. H. Borias, of Vitry-le-Françoise, France. No. 8279; May 2, 1892.

This invention consists in the employment of special castings, whereby a gas-bag may be used to shut off gas without opening up the ground; and it is especially applicable in the case of bye-passes for exhausters, station-meters, governors, and such like, the valves of which are seldom used, and are apt to become stiff. The illustration



shows an elevation of the arrangement as applied to a two-way casting or pipe; a sectional elevation of same, showing the bag expanded; a plan of the street-box with the cover removed; and a plan of the two-way casting or pipe.

The proposal is to cast or otherwise form the pipe A with a bulged portion B, into which the bag D is placed and expanded when it is desired to shut off the gas. The bulged portion is provided with an upright branch-pipe C, of suitable diameter for the introduction of the collapsed gas-bag, and its inflating tube, which is provided with a stop-cock at its top end. The pipe C is carried up to the surface of the ground, and provided with a moveable cover, enclosed within an ordinary street-box E. Small pipes F F^1 may also be fitted on either side of the branch-pipe C, and led up to the street-box E, where they are provided with covers, so as to allow of testing for pressure, leakage, and such like, by connecting them with a portable test-meter.

Gas or Combustible Vapour Engines.—Robinson, H., of Manchester. No. 9161; May 14, 1892.

This invention relates to improvements in engines in which the piston is propelled by the expansion of an explosive mixture of gas or vapour and air; and parts of the improvements are applicable to engines described in patents No. 14,787 of 1890 and No. 1083 of 1891.

In place of holding open the exhaust-valve to govern the engine, in the manner explained in the 1891 patent, in some instances, where a very steady action is required, a governor is employed to act upon the gas supply, and a centrifugal governor is used driven by the engine. The engine works on the well-known "Otto" cycle. The mixing-valve is of disc form, with a number of even sized holes, some of which supply the gas or vapour, and the remainder the air into the cylinder.

The gas-valve upon which the governor acts is formed cylindrical for part of its length and conical at its end—the conical part being moved by the governor into and out of the position in which it fills the hole through which the gas or vapour passes; and it thus gradually increases or diminishes the supply of gas or vapour. A light spring presses against the end of the valve; and a plug or its equivalent bears against the spring, in such a manner that the speed of the engine can be varied by the adjustment of the plug.

The governor is of the centrifugal type, constructed preferably as follows: A light steel flat spring is formed, of such a length that it fits into a groove or recess in a revolving head of the governor. Weights are attached to the spring in such a manner that their centrifugal force deflects the spring at the centre; and this acts upon a light spindle, which acts upon the gas or vapour valve. To keep the spring in position, and yet allow of its being deflected, it is held in position at its ends; being placed in the groove or recess in which it can slightly slide. The revolving head is arranged in two parts of ring or chamber form screwed together; the groove being formed between them, so that, by taking off one part, the spring can be removed or replaced by a new one, if necessary.

Another mode of governing the engine is as follows: The rod of the eccentric or cam upon the engine-shaft may be connected to a small rocking lever, prolonged to the other side of the axis upon which it moves. Upon one end of this lever is pivoted the rod, with projection acting upon the toothed wheel and the exhaust-valve, as described in the 1890 patent. Upon the other end of this lever, another rod may be pivoted; this rod acting upon the gas or vapour inlet-valve. It may be moved into or out of position, for acting upon the gas or vapour valve by its own inertia, or by a centrifugal governor.

Gas-Meters.—Doig, W. B., of Tranmere, Cheshire. No. 10,444; June 1, 1892.

The object of this invention is to provide wet gas-meters with a device which enables the surplus liquid to be withdrawn from time to time from the syphon-box, without incurring any danger of the orifice being left open.

Fig. 1 [next page] is a sectional elevation of one form of the invention; and fig. 2 shows the method of its application to existing wet meters.

In fig. 1 A is a socket firmly secured to the side B of the syphon-box—for example, by screwing the socket into the washer-ring soldered to the casing. This socket is provided with orifices C and G, which form a communication from the interior to the exterior of the syphon-box, and provide for the egress of the liquid. D is a conical plug or eduction valve, designed to control this communication. The valve is normally pressed upon its seat by a spring E, the pressure of which

can be adjusted by a screw-cap F. To educt the liquid, the valve D is pushed away from its seat; and this enables the liquid to immediately flow out through the opening. Directly, however, the valve is released (after the syphon-box has been drained), it flies back on to its seat by the pressure of the spring, and so prevents any escape of gas from the meter.

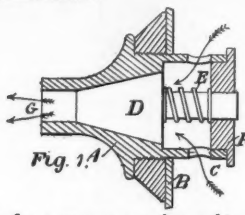


Fig. 1.

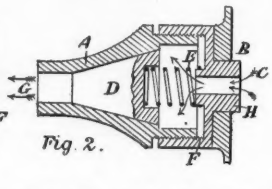


Fig. 2.

In fig. 2, means are shown for screwing the device into the eduction orifice of the syphon-box of an existing meter that the screw plug has hitherto fitted into. D is the valve; and E, the spring engaging the valve, and also the screw-cap F. The latter is provided with a screwed shank H, screwing into the orifice I. The eduction passage C is formed in this shank. The action is the same as before: When the valve is lifted from its seat, the liquid flows out through the passages C and G; and the valve, immediately it is released, returns to its seat. The pressure of the spring can be adjusted by the cap F.

Self-Closing Gas-Burners.—Lake, H. H.; communicated from E. F. Angell, of Chicago, U.S.A. No. 1861; Jan. 27, 1893.

This invention provides means whereby the flow of gas is cut off automatically when the light has been extinguished, without the supply of gas being turned off at the cock. This is attained by applying to the ordinary burner a thermostatic bow, composed of two strips of metal, having a different rate of expansion under heat—one end of the bow being fixed upon one side of the burner, and the other secured with a pin-valve moveable in a transverse aperture intersecting the supply-way of the burner.

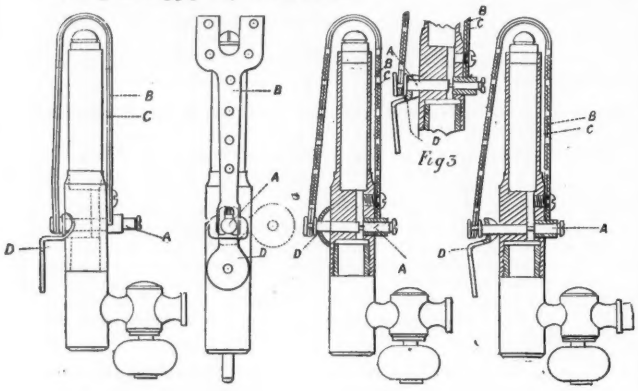


Fig 1 Fig 2. Fig. 4 Fig. 5.

Fig. 1 is a side elevation of the burner and a supply-pipe therefor, having an ordinary stopcock. Fig. 2 is an elevation (at right angles to fig. 1), showing the parts in a position to cut off the supply of gas to the burner. Fig. 3 is a side elevation, partly in vertical section, showing the bow held out by means of the cam. Fig. 4 is a similar view; the bow being expanded by the heat of the flame, and the cam dropped so as to clear the bow. Fig. 5 is a broken sectional view, showing the valve in position to partially close the port.

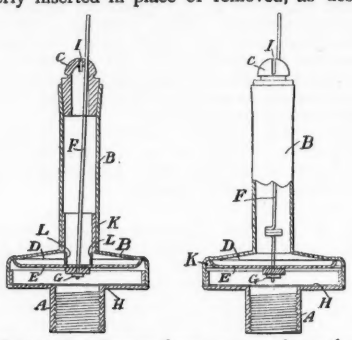
The burner-tube has a vertical gas-passage, and also a transverse aperture therein to receive the pin-valve. A B C represent two metal plates (secured together to form a thermostatic bow), such as iron and copper or iron and steel. The bow is wide in the arch over the tip, and has a slit therein for the flame. One end of the bow is secured on one side of the burner, and the other with the pin-valve A; the valve being adapted to move in the transverse aperture of the burner-tube, and having a port therein. D is a cam lever pivoted on the pin-valve, and having rounded ears, which, when the cam is turned, engage the burner-tube, and withdraw the pin-valve, so that its port will register with the supply-way in the burner-tube, as in fig. 3. When the flame has expanded the bar further, the cam-lever will drop as in fig. 4. Should the flame be extinguished without cutting off the gas by means of the cock, the bow will contract, and in a short space of time thrust the pin-valve in, as in fig. 1—thus automatically cutting off the flow of gas before any great quantity has escaped.

A novel feature of the burner, according to the patentee, is its adaptability to the saving of gas. Heretofore in burners of this kind provision is made for cutting off the supply of gas only when the flame has been extinguished; but with this device, should the gas pressure be so strong that an undue amount of gas would be consumed, the bar will be less heated and the pin-valve moved so far in as to partially close the supply-way—thus diminishing the supply, as shown in fig. 5.

Gas-Burners.—Thompson, W. P.; communicated from the International Self-Closing Gas-Burner Company, of Milwaukee, U.S.A. No. 3269; Feb. 14, 1893.

This invention relates to an arrangement whereby the flow of gas through the burner is automatically shut off, and prevented from escaping, when the flame has been extinguished in some manner other than by shutting off at the cock.

A is the base of the burner; B, a shell or body connected thereto by means of screw-threads; and C, the tip provided with the usual slit or aperture I, for the escape of gas, and also to one side thereof with a screw-threaded aperture. The base and the lower end of the body are provided with right-angular flanges, having annular screw-threaded rims, which form the connection between the two parts, and serve as means for disconnecting them, whereby the interior mechanism may be properly inserted in place or removed, as desired. These



registering right-angular flanges form an annular valve-chamber D, in which an annular disc-valve E has vertical play. The valve, at its circular edge or circumference, is upturned slightly, and seats itself gas-tight against the flange. Also, as shown in the left-hand figure, the valve is formed with an upwardly-extending guiding tube K, which fits and slides freely in the shell or body B, below which it is provided at diametrically opposite points with ports or openings L, or with a series of such openings arranged annularly. The tube has the function of accurately guiding the valve, and in its vertical movement bringing it evenly and truly to its seat against the flange. The valve is composed of any desired metal best adapted to accomplish the purpose; the essential feature in the construction shown on the left hand being that it should be of thin metal, so as to yield or spring readily when pressure or force is applied thereto—that is to say, what is termed a "flexible" valve is employed. F is an expansible and contractible rod, having its upper end screw-threaded, and passing through the threaded aperture of the tip; thus forming a rigid connection therewith, and having its lower end also screw-threaded, and passing through a threaded central aperture of the valve. The under surface of the valve at this point is somewhat thickened, to form a boss, whereby a greater surface is afforded for the threads, and also a projection presented for turning the valve, and thereby adjusting it from the lower end. A jamb-nut G takes upon the end of the rod, and bears against the boss. It will thus be seen that the rod also has a rigid connection at its lower end with the valve. The valve may be adjusted either from the upper or lower end of the valve-rod. To accomplish the former, the upper end of the valve-rod which projects through the burner tip is turned; and to accomplish the latter, the boss at the bottom of the valve is engaged and turned, which may be done either by removing the base to gain convenient access thereto, or a tool may be inserted into the bore of the burner base, and made to engage the boss, without the necessity of removing the base.

The construction shown on the right hand, is similar in all essential respects. The rod F, however, instead of being straight throughout its entire length, is provided near its lower end with coils. The guide K is also somewhat different. Instead of extending a tube or arms vertically from the valve into the shell or body, the valve is provided with lugs, extending horizontally from the valve, and acting against the inner surface of the rim of the right-angular flange formed upon the shell or body. The interior of the burner is provided with a wire screen or gauze H, which prevents the entrance of any solid particles that would have a tendency to clog the valve opening, and thereby prevent the closing of the valve.

The rod F, when heated by the application of a light to the burner tip, expands and causes the opening of the valve by a downward movement thereof. The moment the valve is thus opened, a clear passage for the gas to the tip is afforded. Upon extinguishing the flame, the subsequent contraction of the valve-rod serves to return the valve to its seat; and thus shut off the further flow of gas.

Practical experiments, says the patentee, have demonstrated the fact that the shell or body is also affected somewhat by the action of the heat; so that, while the rod F is expanded very quickly, and sufficiently to force the valve clear of its seat, the shell or bracket is also lengthened to some extent. The moment the flame is extinguished, the rod, being of small area, and being surrounded by the gas which has now lost much of its heat, cools more readily than the surrounding shell or body, which retains its heat longer. This cooling immediately causes the rod to contract, and seat the valve carried thereby. It is apparent, however, that, when this occurs, the shell or body has not yet contracted sufficiently to assume its normal position; and the consequence is that considerable strain is experienced, which it is necessary to provide against. To do this, a valve is constructed of thin metal, which gives it a certain degree of flexibility, or else the rod is provided with a series of coils, which accomplish the same function—that is, hold the valve yieldingly to its seat. In this latter instance, the valve may be either of thin metal or not, as desired.

APPLICATIONS FOR LETTERS PATENT.

7764.—Armitage, F., "Controlling the flow of gas passing from the gasholders to the street mains, and obviating the putting out of action of one gasholder before another is placed in action." April 17.

7770.—Fischer, F., "Igniting appliance for incandescence gas-lamps." April 17.

7807.—Hutchinson, W. N., "Steam and gas engines." April 18.

7811.—Brooks, S., "Gas-burners for purposes of illumination." April 18.

7831.—Williams, W. B., and Dean, W., "Gas-burner." April 18.

7960.—Boult, A. J., "Gas or oil engines." A communication from L. Heinen. April 19.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Experimenting with a View to the Development of Gasholder Construction.

SIR,—When sending my first communication on the above subject, I did not anticipate that a voluminous correspondence would result. Even if carried to double its present length, the matter might not be disposed of to the satisfaction of both parties. With this prospect in view, perhaps there will be nothing lost in leaving the question where it stands at present. In doing so, I desire to thank Mr. Cripps for his valuable letters, including the last, on the contents of which I make no comment.

E. LLOYD PEASE, Managing-Director,
Ashmore, Benson, Pease, and Co., Limited.

Stockton-on-Tees, April 29, 1893.

A Discouragement for Metric Enthusiasts.

SIR,—Doubtless there are some of your numerous readers who are in favour of the metric system of weights and measures; and for their encouragement, I respectfully ask you to kindly allow me, through your columns, to make a few remarks on the article under the above heading in the JOURNAL for the 11th inst.

You say: "When it can be shown that one-half or one-quarter of the 'subjects' already taught in elementary schools are really retained by the pupils in useful shape six months after leaving school, it will be time enough to talk of dislocating the commerce of the country in order that school teachers may escape from the obligation of superintending their charges in the tedious task of getting up the 'tables' by heart." Now, it is simply because school children are unable to retain for "six months after leaving school" one-half of the subjects taught, that public teachers plead for escape from the obligation of teaching so much *useless* knowledge. The annual reports of Her Majesty's inspectors throughout every district of the United Kingdom prove that public teachers do not elude the requirements of the Codes issued from time to time by the Government Departments. The reason why the results of their faithful discharge of duty are so evanescent is simply because, except in the first four rules of arithmetic, this subject is not founded on any intelligible principle, but on an "irrational and confused system (or want of system) of weights and measures!" So long as want of *principle* continues in the "tables" to be learned by heart by children, or even by adults, so long will they vanish from the memory very quickly after being learned. But found these rules on the decimal principle, and, on the authority of Mr. Mundella and many other educationalists, two years of a "tedious task" will be saved to teachers and children. It is not "rampant pedagogy" that professional experts should point out to the public that *useful* rather than *useless* knowledge should be taught in our State-aided schools, and that public funds should not be expended wastefully in vain attempts to accomplish impracticable things. Instead of "dislocating the commerce of the country," the introduction of the mathematically accurate metric system of weights and measures would greatly simplify commercial transactions all the world over. This is the testimony of almost every Chamber of Commerce in the kingdom. The population of the countries that have adopted the metric system amounts to 420,350,186. These include all the countries of Europe except Great Britain and Russia, and all those of America except the United States. The facility with which the American Iron and Steel Association changed first to the ton of 2000 lbs., and recently back to the ton of 2240 lbs. after so many years' use of the short ton, is proof that a change from one weight to another is easily effected, and presents no obstacle. The difference between the "long ton" and 1000 kilogrammes is less than 36 lbs.; so that the price of the long ton, and the "French ton," as the thousand kilogrammes may be called, could be adjusted with perfect ease, and thus place us in line with the great majority of the civilized nations of the world.

The demand for a new English language constructed on what are called logical principles is not necessary. Our language, in its grammatical construction, is very much simpler than any other printed language extant; and those to whom it is not native learn to speak it correctly in much less time than they can acquire any other foreign tongue. The genders of its nouns accord with Nature. Its males are masculine, its females feminine, and all other nouns are of no gender, unless when employed poetically. Its adjectives require no inflexion for gender, number, or case. Its verbal inflexions are confined to the participles and the present and past tenses. Its syntax is founded on principles which are violated only in rare instances of idiomatic phrases which are not necessary to be used in ordinary conversation. Its so-called orthography, however, is the great stumbling-block to foreigners. It has been prophesied that the English language is destined to be the universal speech of the world. The epoch when this prophecy shall be fulfilled will be hastened by fifty years, according to Mr. Stead's "Letters from the Vatican," if we could reduce the sounds of our alphabet to a consistent system. Each letter should have only one sound, or two sounds at most, which should be easily recognizable from their collocation with other letters. A Committee of Lexicographers, under the direction of the Government Education Departments, could accomplish this in a very short time. It would not be necessary to invent new letters, or to dispense with many, or even any of our present letters. Our best pronouncing dictionaries could be consulted and compared, and the best and most consistent use of the letters could be adopted.

JOHN MACARTHUR,
Convener of the Permanent Committee of the Educational Institute of Scotland on the Decimal System, &c.

New Monkland, Airdrie, N.B., April 20, 1893.

The Water Supply of Oswestry.—Owing to the drought, the Oswestry Corporation have found it necessary to take advantage of the power given them by the Liverpool Water Act to obtain a supply of water from the Liverpool Corporation at the rate of 6d. per 1000 gallons.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bill read the first time: Blackpool Improvement Bill.

Bills read a second time, and committed: Barry and Cadoxton Local Board Bill; East Stonehouse Water Bill; Plymouth Corporation Water Bill; West Hampshire Water Bill.

Opposition withdrawn: Frimley and Farnborough District Water Bill.

Bills Royal Assented: Dublin Corporation Bill, Stockton-on-Tees Corporation Gas Bill, Wolverhampton Gas Bill.

A petition against the Devonport Water Bill was presented from the Corporation of Plymouth.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read the first time: Electric Lighting Provisional Orders Bills (Nos. 3 and 4), referring to Hackney, Hammersmith, Poplar, Altrincham and Bowdon, Barnet, Bridgend, and Taunton.

Bill read a second time: Accrington Gas and Water Bill.

Bills reported: Electric Lighting Provisional Orders Bill (No. 2); London County Council General Powers Bill; New Swindon Gas Bill; Sheffield Corporation Water Bill; South Staffordshire Water Bill.

Bills read the third time and passed: Blackpool Improvement Bill; Electric Lighting Provisional Orders Bill (No. 2); Wolverhampton Gas Bill.

HOUSE OF LORDS COMMITTEE.

(*Before Lord* SANDFORD, *Chairman; Earl* KINGSTON, *Lord* CHURCHILL, *Lord* DE VESCI, *and Lord* CHEYLESMORE.)

Wednesday, April 26.

CRYSTAL PALACE DISTRICT GAS BILL.

This Bill—which (*inter alia*) is to authorize the Crystal Palace District Gas Company to raise additional capital, to convert the existing authorized capital and debenture stock, to provide for the sale of new stock to consumers of gas in the Company's district as well as to their employees, to alter their Act of 1873 in respect to the quality of their gas, and to authorize amalgamation with any Metropolitan Gas Company south of the Thames—came before the above Committee to-day.

Mr. BALFOUR BROWNE, Q.C., Mr. MEYSEY THOMPSON, Q.C., and Mr. FREEMAN appeared for the promoters. The opponents of the Bill were the London County Council, represented by Mr. POPE, Q.C., and Mr. MOON; the Corporation of Croydon, by Mr. BIDDER, Q.C., and Mr. R. G. GLENN; the Vestry of Camberwell, by Mr. MEGONE; the Beckenham Local Board, by Mr. ERSKINE POLLOCK, Q.C.; and the Vestry of Lambeth, who reserved Counsel.

Mr. BALFOUR BROWNE, in opening the case, said the Bill was for the purpose of authorizing the promoters to raise additional capital, to convert their existing capital, and for other purposes. The Company was formed in 1854, and was incorporated in 1858; Mr. Erasmus Wilson—a gentleman very well known in the scientific world—being practically the founder, and holding the position of Chairman for a great many years. The capital authorized by the Act of 1858 was £100,000 in shares, and borrowing powers to the extent of £25,000 were granted. In 1865, further share capital to the amount of £100,000, with power to borrow £25,000, was authorized; and in 1873, another £150,000 with £37,500 borrowing powers. The total amount of the capital created was £400,000; and there was £37,500 of 6 per cent. debenture stock, of which only £9375 had been paid up. The total expenditure of the Company had been £390,805; so that there was very little capital to fall back upon. They had only £9194 share capital to call up, and £28,125 of loan capital—making £37,319. The learned Counsel then referred to the increase of population in the Company's district, and said he thought the Committee would come to the conclusion that further capital was absolutely necessary to meet the increased demand. Recent legislation had, to a large extent, made the consumers of gas and the shareholders in a gas company partners in the concern; and the evidence he should adduce would, he hoped, convince their Lordships that special regard had, in every particular, been paid to this Company's customers, and that the Bill was as fair a one as could be laid before Parliament. While proposing to convert the present 10 and 7 per cent. stocks into a 5 per cent. stock, and thus increase the nominal amount of capital, they did not propose to raise the amount they could pay in dividends at par. The additional capital suggested was £200,000, which it was estimated would serve for a period of thirteen years. The augmentation in the consumption of gas was at the rate of 5¼ per cent. per annum; and he was glad to say that the scare which at one time prevailed in regard to the electric light did not really seem to be affecting gas companies to the extent that was thought. The Company's increase was going on to an enormous extent; and the poor in the district were beginning to be large consumers of gas through prepayment, or "penny in the slot," meters. If the increase continued, as they expected it would, at the rate of 5 per cent. per annum, the Company would double their consumption in thirteen years, while it would possibly be doubled in ten; and for this extra consumption all the capital asked for would be required. The Bill also sought power to raise by borrowing one-third, instead of one-fourth, of the total capital. Being able to borrow at 3½ per cent. instead of paying 5 per cent. on share capital, was a distinct advantage to the consumers; and a similar privilege had been given to the South Metropolitan and other gas companies. With regard to the auction clauses in the Bill, learned Counsel explained that it

was intended to offer the shares not only to the present proprietors, but also to the consumers of gas and to the persons employed in the Company's works. The maximum price the Company might charge for gas hitherto had been 6s. per 1000 cubic feet; but in the Bill they were proposing to fix the standard at 3s. 6d. The price had been from time to time lowered from 5s. 6d. in 1859 to 2s. 6d. in 1889, when the cost of labour and coal so advanced that the Company had to raise the charge to 2s. 9d., at which it now stood. The Company asked to be allowed to supply 14-candle gas; but some of the opponents wished it to be of 15-candle, and one even of 16-candle power. If the Committee put this upon the Company, they could not supply gas at less than 3s. 6d. per 1000 cubic feet. The Bill also proposed the repeal of the old section in the Act of 1873, by which the Company were not to allow more than 20 grains of sulphur per 100 cubic feet of gas, and to substitute 30 grains, which would enable them to manufacture the gas cheaper, and to remove the nuisance caused by the generation of sulphuretted hydrogen by the use of lime. The learned Counsel further explained that the Bill contained provisions for repealing the prohibition against amalgamation with the South Metropolitan Gas Company, although he said they had no intention of entering into such a combination; but as the Company were now in Parliament, it was thought desirable to remove the restriction. He concluded by dealing with the various petitions against the Bill.

The following evidence was then given in support of the Bill:—

Mr. *C. Gandon*, M.Inst.C.E., Engineer of the Company, gave details as to the capital powers which had been granted to the Company from time to time, and said the total amount they could at present call up was £28,000. The increase in the consumption of gas during the last few years had been regular. In the past fourteen years, it had doubled itself, and was now advancing at the rate of 5 per cent. per annum. Therefore, in consequence of the augmented consumption and the building going on in the district, it was needful to raise more money; many parts of the works being at present taxed to more than their full extent. He confirmed the statement made by Counsel as to the decrease in the price of gas from 5s. 6d. to 2s. 6d.; and he said the maximum price the Company were entitled to charge was 6s. The recent increase to 2s. 9d. was owing to the extra cost of coal and labour. All the London Gas Companies, and most of those in the provinces, had raised their prices from the same cause. The works of the Company, situated at Lower Sydenham, consisted of 40 acres of land, with a siding connecting them with the Mid-Kent branch of the South-Eastern Railway. He considered that the raising of the standard of illuminating power from 14 to 15 or 16 candles would be a disadvantage both to the Company and to the consumers. The coal used by the Company was Durham gas coal, which was the most economical, because it could be brought up by sea. With this coal they could obtain gas having an average illuminating power of 15 candles; but it was liable to fluctuation.

Mr. MEYSEY THOMPSON: The moment you raise the standard above 14 candles, you must adopt some artificial means of increasing the quality of the gas produced from the coal.

Witness said that was so; and it could be done by the use of either cannel or petroleum. Cannel was expensive, and was daily becoming more difficult to get; while the residuals produced from it were less valuable than those obtained from the Durham coal. The coke was, in fact, almost valueless. The average illuminating power of the gas supplied by the Company last year was 15·26 candles; but, on occasions, it was only just above the standard of 14 candles. If the manufacture of 15-candle gas were imposed upon the Company, it would entail an additional cost of 2d., if not more, for each candle. In his opinion, it was better for the consumer to have cheaper gas of lower illuminating power; and with the improved burners now available, its efficiency could be considerably increased. There had been in the district a great development in the use of gas for cooking and heating purposes, for which cheapness was essential, and high illuminating quality not of so much importance. The increase in the amount of sulphur allowable (from 20 to 30 grains per 100 cubic feet) would, he was strongly of opinion, be perfectly inappreciable by the consumer.

Mr. MEYSEY THOMPSON: What is the main reason you would give to the Committee for the proposed increase?

Witness: It would economize the manufacture of the gas; we should be able to use a smaller quantity of lime; and we should have less trouble in disposing of it after it has become fouled. At present, we find very great difficulty in getting rid of it; and it has to be sent by railway to considerable distances at much expense. Now it is in a highly foul state—more in the condition of sulphide of calcium—and has a very strong smell; but with a higher limit of sulphur compounds, we could convert nearly the whole of it into carbonate.

What is the process by which you eliminate these sulphur compounds?—The first process at my works is to take all the carbonic acid out of the gas, which is then sent into the purifiers. Of these there are six, filled with lime, through which the gas passes—the carbonic acid being taken out in its progress. Then there are two large purifiers, which contain sulphide of calcium. That is supposed to be the only form of lime which has any direct influence upon the so-called sulphur compounds other than sulphuretted hydrogen. The contents of these two purifiers are kept in a state of sulphide by carefully excluding carbonic acid from them, and allowing a certain portion of the sulphuretted hydrogen from the gas to go through. This acts upon the sulphur compounds, or the compound of sulphur and carbon, and removes a portion of them; but there is no known method by which they can be entirely eliminated. They can be brought down in some instances to as low as 7 or 8 grains per 100 cubic feet; but sometimes there will be an unaccountable rise—perhaps from 7 or 8 to 18 or 20 grains. This occurs suddenly, without any reason for it that one can discover. That is the difficulty we have in maintaining the 20-grain standard. We are obliged to use a large quantity of lime in order to avoid occasional excesses. If the 30-grain standard were granted, I have every reason to believe we should still work down to below 20 grains, except when any occasional rise might take place. I may say that at Croydon, the neighbouring Gas Company, where, so far as I know, they are not under any legal restrictions as to that, they keep the gas as free from sulphur compounds as we do in our Company, though they are not obliged to do so.

On the other hand, if you have a limit beyond which you cannot pass, if you are on any occasion defective, for however short a time, you are liable to a penalty?—Yes, we are liable to a penalty.

In further examination, witness said if it were possible to eliminate the whole of the sulphur compounds, it might be worth while going to some expense to do it; but the difference between 20 and 30 grains was so small that it was money thrown away. Sulphuretted hydrogen, on the contrary, could be completely removed. The cost of purification, in order to keep the sulphur at so low a standard as the present one, was increased quite 1d. per 1000 cubic feet, in addition to which great difficulty was experienced in disposing of the foul lime; and there was the consequent risk of nuisance. They had trouble in getting men to handle it, as it was exceedingly offensive—making the hands and eyes sore.

Cross-examined by Mr. BIDDER, with regard to the extent to which the Company had exceeded the present limit of 20 grains of sulphur, witness said that it happened occasionally, and they had on one occasion been fined for it. Though the fine was not oppressive, they did not like the reproaches it brought upon them from their customers. Asked whether the sulphur did not produce deleterious effects upon the binding and gilding of books, witness said he did not think that it had much influence, but that it was the acid in the leather that caused it. There were cases where it had occurred where not gas but candles were burnt—for instance, in the Athenæum Library. A considerable number of gas companies had the restriction of 20 grains; but there were others with 30 grains, and some had no restriction at all.

Mr. BIDDER: Has gas science gone backward, that you cannot now produce such good results as you used to do in the past?

Witness said he did not know that it had gone backward; but, so far as the sulphur compounds were concerned, they had not discovered any new method of dealing with them. The Company used from 3000 to 3500 tons of lime a year for the purpose of purification. They could not maintain 16-candle gas with Durham coal; and he doubted if they could give 15¼ candles as a minimum, with Londonderry or Wearmouth coal. Questioned as to the effect of the standard price and the sliding scale, and asked whether, if the Bill were sanctioned, it would not enable the Company, by increasing the price by 2d. per 1000 cubic feet, to take another £5000 dividend out of the consumers' pockets, witness admitted that this would be so; but he said the tendency of the sliding scale everywhere had been to give an extra inducement to reduce the price of gas.

Mr. ERSKINE POLLOCK cross-examined the witness as to what extensions of works the Company proposed. He replied that he had not the plans with him; but they were at present engaged in building a new retort-house, and were going to put up a new station meter, together with a range of buildings for workshops and sulphate of ammonia plant, &c., the total cost of which would be £23,000 or £24,000. Within the next two or three years, they would spend about £40,000. The maximum make of gas per day was 5 million cubic feet; and they could not make more with their present retorts. He considered the suggestion for having a testing-place in the Beckenham district, to be controlled by the Local Board, very objectionable, as other local authorities would want the same. The present testing-place was within a short distance of the Beckenham boundary; and the Local Authority had perfectly free access to it.

In cross-examination by Mr. MOON, witness stated that in the districts of The Gaslight and Coke, South Metropolitan, and Commercial Companies the Gas Referees prescribed within what limits the purity of the gas should be kept, and that at present they were 17 grains of sulphur per 100 cubic feet in summer, and 22 grains in winter. They had power to alter these limits. The reason of the distinction between summer and winter was that it was supposed there was greater liability to change in cold than in warm weather—sudden cold affecting purification. There would be no advantage in the Company coming under the jurisdiction of the Gas Referees.

Mr. MOON remarked that, if the Company could show to the Gas Referees any reason why they should be treated differently from the three Metropolitan Companies, and be allowed to supply gas of less purity, it would be within their jurisdiction to permit them to do it.

Witness said, if the Company were within their jurisdiction, he presumed they could; but he did not think they would be likely to do it, because the other Companies would consider themselves unfairly dealt with. The illuminating power of their gas was generally over the standard now; but it sometimes went down very close. They used a small quantity of petroleum spirit to improve its quality, and found it fairly satisfactory; but he was not sure that it was not more expensive than cannel.

Mr. *H. E. Jones*, Engineer and General Manager of the Commercial Gas Company, examined by Mr. MEYSEY THOMPSON, said he had visited the works of the Crystal Palace Gas Company, had considered the Bill, and had investigated the abstract of accounts for the last ten years. From the information he had thus derived, he had come to the conclusion that there was a distinct necessity for the expenditure of further money. The Company had a temporary loan of £16,600 in their general balance-sheet, showing that they were short of working capital. The existing capital amounted to £4 9s. per ton of coal carbonized, or 9s. 10d. per 1000 cubic feet of gas, which was much below the usual scale for the extent of their sale; showing very careful and prudent administration in the expenditure of their capital. The new capital and borrowing powers would be exhausted in about fourteen years. He approved of the insurance and reserve fund provisions, and thought the standard price of 3s. 6d. per 1000 cubic feet reasonable.

Mr. MEYSEY THOMPSON: Taking into account the great disturbances lately, and the increased cost of gas production, owing to the advance in coals and the variation in the price of residuals, do you think that a considerable margin should be allowed?

Witness said there should be a considerable margin. The London Gas Companies, with larger and better districts, had standard prices of 3s. 9d. and 3s. 6d.; and he did not see why this Company should be placed at a disadvantage. The London Companies had been earning 6 per cent. for about two years, though not dividing it; and the 2s. 9d. at present charged by the Crystal Palace Gas Company was not sufficient by £8000 to pay their dividend in the past two years. This would be equivalent to about 2½d. per 1000 cubic feet. He thought the

Company could be trusted with a standard of 3s. 6d, because it could never be to their interest to raise the price of gas, as they must lose dividend whenever they did so. With reference to the question of the difference between 20 and 30 grains of sulphur, it might modify the nuisance to have the latter limit; and as the works were situated in a favourite residential district, there was more reason for the Company being particular in the matter of nuisance from the purifying process than gas companies whose works were nearer the river, and away from a high-class residential property. A quantity of 10 grains in 100 cubic feet represented 10 grains in 23,000 grains, or 1-2300th in weight; and he doubted whether any consumer would discover the difference between one gas and the other. With regard to the clause of the Bill proposing to allow the Company to obtain coal from the South Metropolitan Gas Company, he considered it an important provision, because of the extra cost of conveyance between the Crystal Palace and the River Thames. All the coals from the Durham field to the South of England came to that district by water, which was by far the cheapest mode of transit. There could not be much less than 2s. 6d. a ton charged between the river and the Company's works; and there would be the extra cost of carrying and unloading the coal at unfavourable places. The South Metropolitan Company had on the river very fine cranes and derricks in excess of their immediate requirements; and they would be a great help to the Crystal Palace Gas Company. As to amalgamation, there could be no objection to putting the Company on the same footing as all the other Gas Companies south of the Thames. Previous amalgamations had operated to the benefit of the consumers. The conversion of the stock into a 5 per cent. one could not possibly be detrimental to them, as it could not matter whether or not they paid half the dividend upon double the nominal sum.

Mr. MEYSEY THOMPSON: With regard to the illuminating power of the gas, one or two petitioners suggest that there should be an increase. Would that, in your opinion, be an advisable course?

Witness replied it would not. Under the sliding scale, the consumer was a participator with the shareholder in all possible economies. As a matter of course, the consumer must pay the cost of making the gas as well as the profit to the Company. As to any economies to be derived, the shareholders only had one-fourth, and the remaining three-fourths would go to the consumers; therefore it became a consumers' question to the extent of three-fourths of any saving made by a company who manufactured gas in the best and cheapest way. The most economical mode of producing gas was to make it from Durham coal alone, without any artificial enrichment. There were no means of enriching it known to him which did not add much more to the cost per 1000 feet than the extra half candle or candle was worth which might be obtained by the expenditure. Cannel was used to raise the illuminating power of gas; but cannel was becoming very much scarcer and dearer, and the same result of increased illuminating power could be procured by using regenerative and other high-class burners. The extension of the use of gas for cooking and heating purposes and for motive power and ventilation rendered it hardly worth while to obtain the additional lighting value at increased cost. What gas companies very much wanted now was to be able to sell gas cheaply for the purpose of fuel; and it seemed to him to be vandalism to burn in an ordinary fireplace gas made so rich and good as 16 candles.

In reply to Mr. POPE, as to the amount of impurity being subject to the determination of the Gas Referees, witness said the Referees had fixed a sulphur limit which involved putting up most expensive plant; and gas managers devoted their attention most painfully to this one particular process, accompanied as it was by great liability to nuisance, when that attention had far better have been directed to economic matters on the question of making gas.

Mr. POPE: I agree that it is difficult for managers of gas-works always to keep within the requirements which, in the interest of the public, the Board of Trade have fixed; but is there anything special in the circumstances of the Crystal Palace Gas Company's district which should subject them to a different sort of law to that prevailing in the rest of London?

Witness said the difference lay chiefly in the character of the neighbourhood in which the works were placed; Sydenham being a highly-favoured residential district. The purification of gas to a low amount of sulphur was a very critical and difficult process, and, if not carefully carried out, might give rise to nuisance. The Gas Referees had fixed a standard which it was difficult and expensive to maintain, and it was accompanied by a liability to nuisance; and he contended that they ought to be allowed to make gas cheap, and free from nuisance.

Mr. POPE: I remember going through the Commercial Gas-Works when there was not a sniff about the purifiers. That, I suppose, is your general condition?

Witness said this was secured by a special process originated by himself, which had to be watched with very great care; but it involved what he considered an unreasonable amount of plant.

Mr. *G. Livesey* said that for twenty years he had been a Director of the Crystal Palace Gas Company, and at the present time was Chairman of the South Metropolitan Gas Company. The conditions under which gas companies now existed were totally different from what they were when the Company obtained their Act, and started with power to charge 6s. per 1000 cubic feet. Then they were in the position of a protected monopoly, and were able at all times to charge a price sufficient for them to pay their full dividends; so that these were absolutely secure. Now they were in a condition of competition. On the one side they had cheap oil, which could be had at as many pence per gallon as twenty years ago it cost shillings; and, on the other side, they had electric lighting. Therefore, unless they served the customers to the best of their ability, they would lose their business; and one of the most essential points was to fix the price of gas as low as possible. Witness explained the manner in which it was proposed to re-arrange the Company's capital, and to issue the new capital; and with regard to the initial price of 3s. 6d. in the Bill, he said he never approved of its insertion. He thought it ought to be 3s. 2d.; but it was put in, he supposed, because the promoters might be called upon to give up something. If they were required to produce 16-candle gas, and to take out 10 grains of sulphur, it would add 4d. to the price; and they could not do it for 3s. 2d. But with relief from those restrictions, they could reduce the initial price to this figure. The Company had sold their gas at a lower price than any of the Suburban Gas Companies; and he claimed credit for the Company for having served their customers well in this respect. Referring to the proposal to include the workmen in the benefit to be derived from the sliding scale, witness stated that he was very anxious all the employees should be made partners in the concern, in the same way as the consumers, so that it should be to the interest of everyone to produce gas as cheaply as possible. This was done in the South Metropolitan Company, and with the best results. With regard to illuminating power, the average quality of the gas supplied by the Company was a little above 15 candles. In order to give 16-candle gas, they would have to enrich it with cannel coal or oil; and the public would have to pay more than the additional quality was worth. The proposals for borrowing one-third of the total capital, and for the conversion of the existing capital into a 5 per cent. stock, were both favourable to the consumers. With respect to the increase of capital, he thought £200,000 was too much; and he put it down at £100,000 or £150,000. But then they would have to apply to Parliament again in about twelve years. As to the increase of the sulphur limit, it cost about 1d. more per 1000 cubic feet to purify the gas to 20 grains than to 30 grains per 100 cubic feet. Moreover, they were compelled to use large quantities of lime; and the operation was very uncertain. Last year, the South Metropolitan Company had a number of excesses, for which they were fined upwards of £200. This year they had had an action for damages for causing the discoloration of paint in the neighbourhood of their works; and it went against the Company. This was caused entirely by the use of lime, which emitted sulphuretted hydrogen. There was no question that the employment of lime was objectionable in the neighbourhood of gas-works. Therefore, while the consumer had to pay an extra price for his gas, the inhabitants in the neighbourhood of the works had to suffer some inconvenience. If the sulphur limit were raised from 20 to 30 grains, it would not affect the consumer one iota. He might burn gas containing as much as 40 grains of sulphur per 100 cubic feet, and never know the difference; and the only means of finding it out was by a most intricate chemical test, extending over 24 hours. The small amount of sulphur caused no injury to the consumer; while it would be a benefit to him if the limit were raised. As to the amalgamation question, the prohibition was inserted for the purpose of the Crystal Palace Gas Company. They did not then want even permissive power to amalgamate, because this might mean that they would be forced into it. He did not think an amalgamation would be at all probable if the prohibition were repealed.

Thursday, April 27.

On the resumption of the proceedings this morning,

Mr. *G. Livesey* was recalled; and, cross-examined by Mr. BIDDER, he expressed his willingness that the illuminating power of the gas should be 15 candles. Asked if there was any reason why it should be more difficult for the Crystal Palace Gas Company to purify their gas to the extent of 20 grains of sulphur per 100 cubic feet than for other gas companies throughout the Metropolis, he said it was very difficult for them all, and the consumer had to pay for it. Moreover, it necessitated the use of lime, which was most objectionable to the inhabitants in the neighbourhood.

Mr. BIDDER: Would not 30 grains necessitate the use of lime?

Witness: Very little. The British Gas Company have a limit of 30 grains at Hull; and they use no lime at all.

At Hull they are not so particular as they are in London; but, as a matter of fact, what reason do you suggest to their Lordships why they should alter your obligation, so as to allow you to send out a more impure gas than is supplied throughout the Metropolis?—It is altogether a mistake, I say, as to the Metropolis. The question of 20 or 30 grains, or even up to 40 grains, is not a matter affecting the consumer adversely to any extent whatever. It would be better for the consumer to have gas cheaper, and the inhabitants in the neighbourhood of the gas-works to be saved the annoyance of the foul lime.

In point of fact, it comes to this—that, in order to mitigate the nuisance in the immediate neighbourhood of the gas-works, you are going to disseminate it over the whole area of your supply?—Only where it is not a nuisance. How is it that none of the French chemists regard the sulphur at all? In Paris, oxide of iron only is used; and from the time of its discovery for the purification of gas, Parliament ought to have absolutely prohibited the use of lime.

If Parisian chemists have discovered that oxide of iron will do instead of lime, why not avail yourselves of that discovery?—Because of the sulphur compounds, which we cannot touch, except by means of foul lime. Oxide of iron will remove sulphuretted hydrogen, but it does not affect the sulphur compounds. The Legislature has been misled by some fanciful chemist.

In further cross-examination, witness said the three days' average was not sufficient, as, when once the purifiers went wrong, there was no certainty of getting them right in three days. Not less than a week should be allowed.

Mr. BIDDER: We are willing to meet you there. That avoids the risk of being fined for a momentary casual lapse.

Witness said that this, no doubt, would be a great advantage. He agreed with the learned Counsel that, if their Lordships were to give a sliding scale with a standard price of 3s. 2d., it would enable them to put up the price at once, and divide another quarter or half per cent.; but he did not think such a course would be right. The uncertain future, with regard to coal and everything else, should be taken into consideration in fixing the standard price; and the future was more uncertain now than ever. If the price of coal went up for the next three or four years, the Company's whole reserve fund of £8000 would be gone. They were entitled, in common fairness, to such an initial price as would enable them at least to pay the present dividend in the event of a rise in the price of coal, or difficulties in the labour market. Asked as to whether the former event was not accompanied by an advance in the value of residuals, witness said it was in 1872 to 1874; but the last time it happened, it was not. To their great surprise, they lost in coals and residuals too.

Cross-examined by Mr. ERSKINE POLLOCK, witness stated that a separate testing-place for Beckenham was quite unnecessary; and one following even the precedent of London, was sufficient for the Crystal, Palace Gas Company. The South Metropolitan Company had six testing-stations; and the Commercial Company had three. The London rule was to have one testing-place for each manufacturing station.

Mr. ERSKINE POLLOCK: Do you think it is an unreasonable thing that the parish of Beckenham, which is one of your best customers, should have a separate testing-place within their own district, and not for the officials to be obliged to take a railway journey to get to one in another district if they want to test?

Witness: There is no trouble about a railway journey. The present testing-place is about a mile from Beckenham; and I consider that one for the common use of all the Local Authorities is sufficient. If Beckenham is allowed to have a separate testing-station, Croydon and Lewisham, and every other place, will also want one. Acts of Parliament generally require that the testing-place shall be not less than 1000 yards from the works. If it is put upon the leading main, you get a fair average of the quality of the gas being supplied; and one is sufficient. There are several mains coming out of the works and running in different directions; but they are connected with the same holder, and carry the same gas.

In cross-examination by Mr. MOON, witness said he would accept the 10-candle pentane Argand standard by which to determine the illuminating power of the gas; and he repeated his willingness to accept 15 candles. Replying to the suggestion that the Company should be placed under the Gas Referees, he said the Act appointing the Referees provided that at least one of those gentlemen should have had practical experience in the manufacture and distribution of gas. After the passing of the Act, in 1868, a Gas Engineer was appointed. But since his death, this provision in the Act had been persistently ignored; and not one of the Referees now knew anything practically about the manufacture or distribution of gas.

Is it your contention that the Board of Trade have disregarded the Act of Parliament, and have constituted a body of gentlemen who are acting *ultra vires*?—They have disregarded the provision in the Act that one of the Referees at least shall have practical knowledge in the manufacture and distribution of gas.

In other words, in your view, the Referees as at present constituted, are *ultra vires*?—I think they are.

Have you taken it to the test of a Court of Law?—I have not.

As to the action brought against you. We have not heard the circumstances under which certain charges were imposed upon the South Metropolitan Company; it was an exceptional occurrence?—It was in consequence of the Durham strike. Our coal supply was entirely changed; and it upset our purifiers.

The application for penalties was made against you in the first instance, and you appealed to the Chief Gas Examiner, who remitted the penalties?—You are mixing up two things. At the time of the strike of our stokers, when we had the greatest difficulty to supply gas at all, both the illuminating power and the purity failed. The Chief Gas Examiner then certified that the failure was due to an unavoidable cause. That is nearly four years ago. Last year there was the strike of Durham colliers. The London Gas Companies are dependent upon Durham for their supply of coal. That was entirely cut off; and we had to get coal where we could. Any change in the coal alters the purifying arrangements; and the Chief Gas Examiner said he could not in that case certify that it was unavoidable. At the time of our strike, we were fighting a great battle; and I do not think any Magistrate would have imposed a penalty upon us; and the Chief Gas Examiner took that view.

In reference to the case in which you were found liable for damage caused by the sulphuretted hydrogen escaping from your purifying plant, had you any statutory power to place the purifiers where you erected them?—We had; but we had not statutory power to create a nuisance.

In other words, you did not use the best appliances for preventing it?—We used the very best appliances; and my contention is that, if the emission of sulphuretted hydrogen sufficient to discolour paint on houses in the neighbourhood of the gas-works is a nuisance, it is impossible to avoid it where you use lime for purification.

If it is a nuisance, I agree with you; but hitherto both you and your neighbours have gone on purifying gas in this way, and so have the Crystal Palace Gas Company, and no action has been brought against them, except in the particular case you refer to?—That is so; but the paint has been discoloured as long as I can remember, and nobody has thought it worth while to commence an action. This is the first time one has been entered upon; and the parties have gained their case.

Mr. BALFOUR BROWNE (in re-examination): As I understand, you really think that, so apt is lime to become objectionable in the purification of gas for any purpose—either for the sulphur compounds or the sulphuretted hydrogen—that it ought to be prohibited altogether?

Witness: I think so, because gas can be purified, for all practical purposes, by means of oxide of iron.

And, as a fact, with the 30-grain limit, which you ask for here, the amount of lime used would at any rate be small; and the purification might possibly be done, as at Hull, by hydrated peroxide of iron?—I am hoping that, if we get the 30-grain limit, we shall be able to reduce the sulphur from its normal quantity of between 30 and 40 grains, by using our ammoniacal liquor, well under the 30 grains, without employing lime at all. But with these limitations we are absolutely prevented from making any improvements. When there is a restriction to the 20 grains, the Companies are fixed to the use of lime on the old stereotyped plan; and they cannot make any attempts to improve upon it, because in doing so they would probably involve themselves in penalties. The London Gas Companies are fixed to the lime, and cannot help themselves.

The experiments might be successful, andmight show some means by which purification could take place without lime; but during the experiments you might fall under the penalty?—At the worst, when you do not employ lime, you may have about 35, and possibly occasionally 40 grains of sulphur; but when you use lime, if you attempt to make experiments, the lime that has absorbed some of the sulphur will, on the most trifling cause, give it up. For instance, it was reported to me only yesterday that, at one of our South Metropolitan works, the sulphur had gone up to 58 grains. The moment it was discovered, it was, of course, shut off. That quantity of 58 grains of sulphur was not in the gas, but was given off from the lime which had previously arrested it. As a fact, the London Gas Companies cannot make experiments at all. If we had been free to make them, I have very little doubt that we should have been able to reduce the sulphur compounds, because we should be very glad to do so, even to meet the sentiment of the public.

As I understand, you think that the legislation with reference to London and the Gas Referees has not been a benefit?—No; I think I could show that the legislation which points to the Referees is now costing the gas consumers of the Metropolis not less than £200,000, with very little benefit to them. In many towns there is no limit with regard to sulphur; while in others it is as high as 30 or 32 grains, and in one case it is as high as 35 grains. In the Metropolis they are excused from not keeping to the limit of the Gas Referees, which is 17 and 22 grains, in cases of unavoidable accident; but in the case of the Crystal Palace Gas Company, it is simply a "cast-iron" rule.

Mr. BIDDER: I say at once, for my clients, that we should have no objection to that being modified.

Witness: The matter would have to be dealt with before a Magistrate; and, if we could show him that the failure was due to unavoidable accident, he would be at liberty to use his own discretion.

Mr. *Corbet Woodall*, M.Inst.C.E., examined by Mr. FREEMAN, said the Crystal Palace Gas Company had for a long time had the reputation for exceptionally good management, as regarded economy and efficiency. The price charged for gas by the Company was exceedingly low. Their works were very admirable—containing every modern improvement; but they were now practically filled up. He thought, therefore, that they had not come to Parliament any too soon for additional capital, with a view to extending their works. He could not see how the conversion of the capital could possibly injure the consumers. The proposal to increase considerably the amount of debenture stock, which would be raised at a cheaper rate than that at which the share capital would be issued, could not by any possibility act to the detriment of the consumers; and he could not understand why this should be made a matter of complaint against the Company. It was proposed to offer the debenture capital by auction, so that it would be issued at the very lowest possible rate; and the undertaking would have all the advantage to be derived from this operation. He agreed with Mr. Livesey that 3s. 2d. was a fair initial price; but he thought that 2s. 9d. would be altogether unfair. The cost of the gas, including the dividend, had averaged 2s. 11d. per 1000 cubic feet for the last three years; and to put an initial price of 2s. 9d. now would punish the Company to the extent of ¼ per cent., which he thought would be palpably unfair. The proposal to increase the illuminating power to 15 candles also met with his approval.

Mr. BIDDER intimated that, after hearing Mr. Livesey's admission upon this point, he did not wish to press it.

Mr. POPE said that 15 candles, with the Board of Trade test, as offered by Mr. Livesey, would be perfectly satisfactory.

Mr. FREEMAN: If all are agreed to accept this, we may pass on.

Witness, referring to the profits of the Company, said that he did not know if the Committee had quite appreciated how very large a proportion was returned to the consumers, in the shape of reductions in the price of gas; but, as a matter of fact, in 1883 the profit earned by the Company was £25,688. Ten years later, with an increase of 60 per cent. in the business, the profit earned was £23,687; the profit was £2000 less, but the dividend paid was £5000 more. That was an increase of only 23 per cent. in the dividend; while the business had grown 60 per cent. A large proportion of the increased profits went, not to the shareholders, but to the consumers. The Company had not even waited to make a reduction of 2d. or 3d. per 1000 feet; but, when they could see their way to making a reduction of 1d., they had done so. He did not think it a reasonable or necessary thing to have testing-stations given to the different districts. He could appreciate the reasons for having more testing-stations in London, because, where there were several different manufactories, each might be turning out gas of a different quality; but here the gas came all from one source; and he could see no reason for more than one testing-station.

In cross-examination by Mr. BIDDER, witness said he could see no reason why the Crystal Palace Company should be put upon a different sulphur standard from other Companies in and around London; and he agreed with Mr. Livesey, that the arguments which he applied to the Crystal Palace Company applied also to the London Companies.

Replying to Mr. ERSKINE POLLOCK, witness said that he could see no reason for giving a testing-station to Beckenham that did not also apply to Lewisham and Camberwell. Where they had many examiners, they were more likely to have differences of opinion as to the results. If the Local Authority at Beckenham desired to have a testing-place, they might put one up and keep a constant examiner there, as they chose; and if they found that the Company were not complying with their regulations, they could send down at once to the official testing-place, and make an observation there.

Mr. POPE: I suppose you contemplate that all the lighting authorities should have access to the testing-station, wherever it might be?

Witness: Most certainly; and that they have.

Mr. MEYSEY THOMPSON: All the local authorities have rights at the testing-station.

Mr. POPE: I confess I do not see the advantage of putting it in one district more than another.

Dr. *William Odling*, F.R.S., examined by Mr. BALFOUR BROWNE, said that he had had a lengthy experience on questions of gas illumination and gas manufacture, and had been a member of several important Committees and inquiries into gas matters. He had paid great attention to the question of the presence of sulphur in gas; and the conclusion that he had come to, in common with many other chemists, was that the variation in the proportions of sulphur in gas was a matter of no practical consequence. The fixing of a 20 or 30 grain limit, or no limit at all, would practically make no difference to the consumers. Taking gas that contained 30 grains of sulphur in 100 cubic feet, if they burnt that 100 cubic feet in the course of six hours—which they might very well do from four burners, at the rate of

4½ cubic feet an hour—under those circumstances, the amount of sulphur discharged into the room would be at the rate of 5 grains an hour. Supposing the gas contained 20 grains, instead of 30, the amount of sulphur would be about 3¼ grains; so that the difference would represent 1¾ grains per hour. Many sulphur-tipped matches, especially those made in England, would contain as much as half a grain of sulphur per match; so that, if they were to strike four of those matches in the course of six hours, they would produce as much sulphurous vapour in the room as by burning the 100 cubic feet of gas. The difference between 20 and 30 grains of sulphur was productive of no injury to books or furniture. Producing a sulphur candle such as was used for disinfectant purposes, which contained a pound of sulphur, he said the directions were to burn one of them in a room; but medical men were in the habit of not being satisfied with that, and they burnt two or three of them.

Mr. BIDDER: Perhaps if you lighted it, their Lordships would appreciate it.

Witness said people were generally excluded from the room when it was burnt; but the furniture and clothes and fabrics were not excluded, it being meant for the purpose of disinfecting them. He mentioned this to show that the injury which undoubtedly resulted from burning gas in ill-ventilated rooms was not at all due to the minute quantity of sulphur which it contained. The room was kept completely closed where the sulphur candle was burnt; and it was lighted at night and left till the morning.

Mr. BALFOUR BROWNE: Of course, an actual deposit of sulphur must take place upon curtains and furniture, and yet no appreciable effect is caused.

Witness: That is so.

Mr. POPE: I do not think that the Professor would say that disinfecting a room has no appreciable effect upon the furniture.

Witness said that he meant furniture, tissues, and fabrics. It had no destructive influence upon fabrics, like the destructive action which undoubtedly arose from the burning of gas, and which had been by some attributed to the proportion of sulphur in the gas. With regard to the injury to bindings of books, that, too, had been wrongly ascribed to the sulphur compounds; but the investigations of the late Professor Faraday and others, as well as of bookbinders, led to the conclusion that books exposed under the same conditions of heat and temperature suffered just as much where gas was not burnt as where it was. The whole question lay in this: Whether it was better to reduce the sulphur somewhat at the cost of purifying by lime, or whether it was advisable to leave the sulphur at whatever it might chance to be, and to purify by means of oxide of iron. His experience was that the gain in purifying by the latter, both in the way of non-liability to nuisance and of economy, saving thousands of pounds in production, far out-balanced whatever advantage might possibly arise from reducing the sulphur from 30 to 20 grains; and that would be an advantage to the consumers of gas.

In cross-examination by Mr. BIDDER, witness stated that his impression was very strong, that the limit on the amount of sulphur was a bad policy, and that Parliament had been misled in introducing the restriction.

Cross-examined by Mr. ERSKINE POLLOCK, witness said that the amount of sulphur given off by the gas was a mere fraction of what was dispersed by means of coal fires. In the case of a very large number of the purposes for which gas was applied, the products were carried out of the room; and in instances in which they were not carried out, the injury that resulted from the products of combustion was so large compared with that from the products due to sulphur that, in badly-ventilated rooms, the removal of the sulphur really had no practical effect upon the amount of the nuisance. He admitted that there was a general opinion that injury was caused by sulphur compounds, and that there were scientific men who held that view.

Professor *Vivian B. Lewes*, Professor of Chemistry at the Royal Naval College and Superintending Gas Examiner to the Corporation of London, in reply to Mr. MEYSEY THOMPSON, said that there was a general belief that sulphur was injurious; but it was his strong opinion that it was an absolute fallacy, and that the difference between 20 and 30 grains would not cause any such injurious action as had been suggested. The destructive effects which had been observed could be explained by other causes. For instance, with reference to the influence of sulphuric acid on the leather of books in libraries, it had been found by exhaustive inquiries that libraries were as much affected where gas had not been burnt as where it had; and that the only thing which had been necessary to bring about the action on the leather, had been alterations in temperature. Where they had a library in which the air had been heated by a flue, and then allowed to cool down again, they would find precisely the same class of phenomena taking place on the bindings of those books, whether or not gas had been used in the room. When gas was burnt by means of an ordinary chandelier, they practically lowered the ceiling level to the level of the chandelier itself, so far as the emanations from the bodies of the persons in the room were concerned. If they observed a certain amount of stuffiness on entering a room, it was due to the exhalations from the bodies of those inhabiting it. When the gas was not alight, those exhalations, being warmer than the air, rose to the ceiling; but when the gas was alight, owing to the heated air above the chandelier, the exhalations were not able to rise above the level of the chandelier, and the oppressiveness of them would be felt to a greater extent. In his opinion, the heat in the zone above the chandelier did by far the largest amount of damage. As far as the consumers were concerned, the difference between 20 and 30 grains of sulphur would be inappreciable. It took some hours to burn 100 cubic feet of gas; and the products of combustion would be spread over the whole of that time. While this was going on, the air being heated, diffusion took place at a considerable rate through the walls, up the chimney, and through the doors and crevices, which the jerry-builder had kindly provided for ventilation; and in that way nine-tenths of the products of combustion were got rid of. In 100 cubic feet of the Crystal Palace Company's gas, 48 cubic feet of carbon dioxide was produced. In the gas there were 20 grains of sulphur; and if there were 30 grains of sulphur, that would give 0·048 cubic foot of sulphur dioxide. If the air of the room was examined after the 100 cubic feet of gas had been burnt, there ought to be found, if the whole of the products remained in the room, 2 per cent. of carbon dioxide; but instead of that, there would hardly be 0·2 per cent.—showing that nine-tenths of the products of combustion had escaped by means of ventilation. In an ordinary room, with a good deal of the ventilation being diffused, it was very often put forward, as a reason for sulphur being injurious, that the sulphur dioxide did not diffuse in the same way, but it got fixed, by combustion with moisture, and by combination with the oxygen of the air, to form sulphuric acid. Attempts had been made to estimate the sulphuric acid so produced, by placing moistened plates and wet linen fabrics exposed to the air; but careful experiments would show that the sulphur dioxide, when saturated with moisture, and the air almost saturated with moisture, did not combine, unless a point was reached at which that water vapour was condensed to absolute water. When the water vapour began to condense in drops of water, as it would do on a window pane, traces of sulphuric acid would be found in it; but those substances would not combine to form sulphuric acid, unless there was absolute condensation. If the standard were raised to 30 grains of sulphur, the use of lime could not be entirely done away with; but it would be limited to a very considerable extent.

Mr. MEYSEY THOMPSON: Do you agree that the use of lime should be limited to the very smallest point possible?

Witness said that limiting the amount of lime, and using oxide of iron to get rid of the sulphuretted hydrogen, would undoubtedly do away with an enormous amount of nuisance which gas-works were accused of giving rise to.

In reply to Mr. BIDDER, witness said that Parliament might have been mis-advised in putting the limit of sulphur so low as it had done. His candid opinion was that it was a mistake to put a limit upon the sulphur compounds other than sulphuretted hydrogen.

This being the close of the promoters' case, after a short consultation between the parties,

Mr. BIDDER said: It is my duty first to speak for the Croydon Corporation. I am, however, happy to tell your Lordship that we have had a little discussion; and, as Mr. Livesey has shown such a desire to be fair in the matter, we have thought it worth while to see if we could not come to terms, and we have succeeded in adjusting conditions which I think I have now authority to say satisfy all the opponents of the Bill. These conditions are that the sliding scale shall be adopted, as proposed by the promoters of the Bill; that instead of having a standard price of either 3s. 2d. or any other special figure, there shall be what we may call a neutral zone of standard price, and that between 2s. 10d. and 3s. 2d. the promoters may vary the price without altering their maximum dividend either up or down; and that then beyond those limits, the sliding scale shall come into operation as proposed in the Bill. That is to say, if they put the price at 2s. 9d., they may divide one-eighth per cent. over and above the 5 per cent.; if they fix it at 2s. 8d., then two-eighths per cent. On the other hand, if they raise the price of gas above the 3s. 2d. to 3s. 3d., they must come down one-eighth in their dividend; and if they put it up to 3s. 4d., they must come down two-eighths. That neutral zone gives the greater elasticity that Mr. Livesey wanted, to meet contingencies of a rise in the price of coal, and so on. With regard to the other knotty point—the sulphur question, we have agreed with the promoters upon these terms: That the standard is to remain at 20 grains; but, in order that they shall not be hard and fast bound in an unfair way, they shall have a clause exempting them from penalty if any defect has been produced by unavoidable cause or accident. Secondly, that it shall be taken that they shall be judged, as Mr. Livesey says, upon the average of a week, and not upon a single day, because we recognize that there might be, as he said, an accidental lapse which it would not be fair to punish them for. Thirdly, your Lordship will remember that in the case of the Gas Examiners of London, there is a 22-grain limit in summer and 17 grains in winter. We do not propose to follow that; but we have agreed with the promoters that they shall have what I venture to call a 2-grain remedy—that is to say, that the standard is to be 20 grains, but that they should not be fined unless they fall behind that to the extent of two grains. We have also agreed with the promoters that they shall be at liberty to raise the new capital by way of preference stock. On these conditions being inserted in the Bill, all the opponents are satisfied that the Bill shall proceed.

Mr. ERSKINE POLLOCK: We assent to all these terms; but, in addition, the promoters have agreed to give us a testing-place at the Local Board Office at Beckenham.

Mr. BIDDER: We do not ask for a testing-place on the part of Croydon; but the promoters have agreed that we shall have access to this testing-place.

The Committee then adjourned till yesterday (Monday), for the arrangement of clauses.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* STUART WORTLEY, *Chairman; Mr.* BARRAN, *Mr.* BENN, *Mr.* GRAHAM, *Mr.* KIMBER, *Mr.* LEES KNOWLES, *Mr.* ROWLANDS, *Mr.* SNAPE, *and Mr.* PHILIP STANHOPE.)

Thursday, April 13.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

This Bill—in which (*inter alia*) the London County Council ask for powers in respect to representation on the Thames and Lea Conservancy Boards, as well as for authority to conduct inquiries on the subject of water supply—came to-day before the above-named Committee.

Mr. FLETCHER MOULTON, Q.C., Mr. FREEMAN, and Mr. F. W. PEMBER appeared for the promoters. The Conservancy portion of the Bill (which was first taken) was opposed by the New River and other Water Companies, for whom Mr. POPE, Q.C., Mr. PEMBER, Q.C., Mr. BIDDER, Q.C., and Mr. CLAUDE BAGGALLAY appeared; the Lea Conservancy Board, represented by Mr. BALFOUR BROWNE, Q.C.,

and Mr. C. B. GEDGE; the Conservators of the River Thames, by Mr. LITTLER, Q.C., and Mr. CLAUDE BAGGALLAY; the Essex County Council, by Mr. H. C. RICHARDS; the Corporation of West Ham, by Mr. BALFOUR BROWNE and Mr. CLAUDE BAGGALLAY; and the Surrey County Council, by Mr. PEMBROKE STEPHENS, Q.C.

Mr. MOULTON, in opening the case for the portion of the Bill indicated, quoted from the preamble to the effect that the Thames, for a distance of 20 miles, passed through the Administrative County of London, and that the County Council had various duties and obligations with regard to the banks of the river, and were interested in many ways in the flow and purity of the water, but had no representation on the Thames Conservancy Board. They therefore proposed to add to the Board seven new members, to be appointed by the Council; and, in regard to the Lea, to increase the representation on that Board from one to three. The importance of the River Thames to the millions of people living in London could scarcely, he said, be exaggerated. A very large portion of the water supplied to the inhabitants was derived either directly from the river or from its tributary the Lea; and therefore the purity of the water was to them of the first importance, while in regard to the prevention of floods, the maintenance of the river as a place of recreation, the preservation of the bridges, and such other matters, it was desirable that the Council should be represented on the Conservancy Board. The learned Counsel traced the history of the Conservancy Acts; laying special stress on the powers given in the Act of 1864 for the preservation of the purity of the river. The Board had not a very large revenue; it being derived from two sources—one from tolls and dues, and the other from payments by the Water Companies. It was evident that the Conservators had little or no money to spare for effectively guarding the river from pollution; and he should submit evidence to show that they had not been able to preserve it. The source from which the money to keep the Thames in order would ultimately have to come was the rates, as there were no other means by which the demand could be adequately met of keeping it in a proper condition. In 1852, before the formation of the Conservancy Board, one of the Water Companies applied to Parliament for powers to take water from the Thames; and an agreement was made between the Corporation of London and the Water Companies for certain payments for that privilege. By the Thames Navigation Act of 1866, the Companies so taking water were required to make an annual payment of £1000—a sum which was increased in 1878 to £2000; so that from six Companies £12,000 a year came into the hands of the Conservancy Board. They were trying to raise, and had succeeded in raising, money for the exercise of their functions, by selling, without parliamentary authority, the waters of the Thames, which had already been drawn upon to an enormous extent. It was their duty, however, according to their statutory powers, to preserve the flow of the river. A most important recital occurred in the agreement which provided for the sale of the water. "The Company, under the said agreement of 1852"—the agreement made with the Corporation of London, to which he had referred—"were authorized and empowered to take from the River Thames a quantity of water not exceeding 20,000,000 gallons during each 24 hours; and the Conservators have lately represented to the Company that the annual income they now receive is inadequate to the proper fulfilment of their duty as Conservators of the river, and that they intended to apply to Parliament in the ensuing session for a Bill requiring the Company and other Companies drawing water from the River Thames to make further annual payments to the Conservators." Then they agreed that the Company should pay £500 a year; and the maximum quantity they were allowed to draw from the river was increased. The total amount thus raised by the Conservators was £4500. Apart from the question of illegality, was it not clear that they had absolutely no power to do such a thing? Those payments, though nominally made by the Water Companies, were, in reality, made by the water consumers and ratepayers. This pointed to a condition of things which emphatically necessitated the representation of London on the Conservancy. If the County Council were represented, the consequence would be that the Board would be in touch with London; and, so far as its interests were affected, London would be prepared to provide such funds, or consent to such Bills, as would be necessary to enable the Conservators to do their duty.

Mr. KIMBER: How do you suggest that the contribution by the Water Companies is indirectly furnished by the ratepayers, unless the Companies are paying their maximum dividends?

Mr. MOULTON said the Companies were bound to provide water in the whole of their statutory limits; and his contention was that the money spent by them to enable them to earn their statutory dividends was paid by the ratepayers of London.

Mr. KIMBER: At present it really comes out of the pockets of the Companies. Until they reach their maximum dividend of 10 per cent., it cannot be said to come out of the ratepayers' pockets.

Mr. MOULTON said that he would deal with this question after the evidence had been given. Passing on to the petitions against the Bill, he said the various County Councils and Local Authorities gave no reason why London should not be represented, but only urged that, if London were, they should be also. He maintained that the claim of London was not negatived by the fact that other people were unrepresented. Referring to the petition of the associated Water Companies, he said it stated as follows: "The capital expended and employed by your petitioners in respect of their undertakings amounts to upwards of £15,000,000. Such undertakings for many years yielded no profit, and for many more years profits little more than nominal; and only comparatively recently have your petitioners begun to realize any adequate return for their enormous expenditure, a large part of which was necessarily made in respect of works in their nature unremunerative." He very much doubted that. The petition also alleged that the balance of power on the Board would be seriously altered; and it urged that no alteration should take place unless the whole question of the constitution of the Board should be reviewed, and provision made for the due representation upon it of all authorities, persons, and places interested in the conservancy of the river. The Companies did not give one single reason why the proposal in the Bill would not be for the good of the river, and why it would not have the effect of causing the Conservancy's powers to be more vigorously and successfully exercised. Dealing with the petition of the Conservators of the Thames, learned Counsel confessed that he saw very little right in their petitioning against an alteration in their body. They had no pecuniary interest at stake; and they would not be injured by the change.

At this stage of the proceedings, it was arranged that the cases of the Thames and Lea should be taken separately.

In reply to Mr. Kimber, Mr. MOULTON said the promoters' case was that at the present time there was a very large population sending sewage into the Thames without its being properly treated, and that there were pollutions actually passing into the Thames, as tested by those whom the County Council had employed for the purpose.

Mr. LITTLER: Will you give us some idea of what they are?

Mr. MOULTON: I will call a witness.

Mr. LITTLER: It is all very well to say you will call a witness; but when charges are made of this kind, which take us entirely by surprise (because over and over again the Council have praised the way in which we have done our work), I want to know how and where these pollutions have arisen. It is an entirely new charge to us, and one upon which we have a right to be fully informed at the first opportunity. We have never had a letter or an indication of the existence of these things up to now; on the contrary, we have been complimented over and over again on the way in which we have done our work.

Mr. MOULTON: I say I am going to call the Chemist, who has analyzed a great number of cases of pollutions flowing into the river; and he will give my learned friend a list of those in which he has analyzed the water, and will state what was the result.

Mr. LITTLER: There has been no single case brought before the Royal Commission on the Metropolitan Water Supply, where all this ought to have been inquired into.

Mr. MOULTON: I do not believe the Royal Commission had anything whatever to do with the pollutions lower than the intakes of the Water Companies; and to a large extent the instances I shall give are below.

Mr. LITTLER: Below the intakes of the Water Companies may be in your own district, from Hammersmith onwards, where you have done the pollutions.

The CHAIRMAN: I take it that you are going to prove the pollutions from unascertained sources.

Mr. MOULTON said he proposed to prove a large number of cases of actual impurities flowing into the river, and that a great portion of the population had no proper means of dealing with their sewage. It was not necessary for his case to show that the conservators had neglected doing what they could; but there was plenty of room for improvement, which could be effected if the Council had representation upon the Board.

Mr. *A. R. Binnie*, M.Inst.C.E., Chief Engineer to the County Council, was then called, and examined by Mr. FREEMAN. He went in some detail into the legislation affecting the Thames, and said he had frequently had to consider the importance of preserving the quantity and quality of the water in the interests of the Metropolis, owing to the fact that a large portion of what was used for drinking purposes was derived from the Thames, and also that in dry weather it was essential to health to maintain a free flow. The area under the control of the Thames Conservancy above the County Council's area was 1724 square miles; and that which was beyond their control was nearly 2190 square miles. Below the western boundary of the county of London, the portion under the Conservancy was 380 square miles. Dealing with the upper river, taking the part above the western boundary of the county of London, there was a total area of 3900 square miles, with about half-a-million inhabitants, and containing 259 towns and villages with a population of 1000 and upwards. The 1724 square miles contained 976,000 persons, many of whom were within the jurisdiction of the Thames Valley Drainage Commissioners, though there were some cases of overlapping jurisdiction. Within that of the Thames Conservancy, in the upper valley, there was a population of 218,205, inhabiting towns and villages where the drainage was dealt with on sewage farms; 18,852 of which the drainage was treated by chemical precipitation, filtration, and the like; and 76,911 which had no proper drainage, but were dependent upon cesspools, the flow from which tended to pollute the soil.

Mr. LITTLER (interposing) said they were now going into evidence to which he should strongly object. There was nothing in the Bill which affected the question of sewage or cesspools; and there was great reason to doubt the accuracy of Mr. Binnie's information. If this question were to be taken up, they would be there for a month

Mr. PEMBER, on behalf of the Water Companies, supported Mr. Littler's protest. He said, if the figures were worth anything, it could only be on the question of whether the Thames was pure or impure. This was a matter which was being investigated by the Royal Commission; and it was one in which the Water Companies, and the County Council too, were very much interested. But what was the use of trying the question again indirectly, when it was perfectly irrelevant to the subject before the Committee, and when the whole thing was still *sub judice* elsewhere.

After some discussion on the point, the room was cleared, and the Committee consulted in private. On the re-admission of the public,

The CHAIRMAN said: The Committee have come to the conclusion that, as at present advised, the state of the river, as to purity or otherwise, does not affect their judgment. But they wish the question to be reserved; and should they desire, at a later stage, to consider it, they will ask for it to be gone into, and it will have to be discussed under all proper safeguard.

Witness was then examined as to the agreements under which the Water Companies were allowed to take water from the Thames, and the extent of abstraction which had taken place, as given in the returns of the Water Examiner. The County Council had, he said, expended on capital account, £850,000 for works of sewage purification and clarification in the lower reaches of the Thames at Barking and Crossness, and £120,000 on shipping, in addition to an annual expenditure of £110,000. This was apart from the main drainage charges, and was money laid out by the Council in endeavouring to keep the lower river pure and wholesome.

In cross-examination by Mr. LITTLER, for the Conservancy, witness

stated that this expenditure was to avoid any longer polluting the river by London filth, and that, if the Council had not done the work, it would have been the duty of the Conservancy to prosecute them. If the water had not been supplied from the Thames for the Companies during heavy droughts, there might have been an epidemic. In answer to the question as to which he preferred, a little illegal abstraction or an epidemic, he said he preferred that the Conservators should so exercise their power as to prevent an excessive abstraction of water. At the present time, with their limited funds, they did all it was possible for them to do.

Cross-examined by Mr. PEMBER, on behalf of the Water Companies, witness admitted that, in consequence of the payments made by them, they had considerable interest in the purity of the river, and that this interest had become much greater in consequence of the increase in the statutory quantity of water they might take, the payments they had to make in respect of taking it, and the difficulties of preserving in the Thames a proper bulk of water. He did not consider the Companies ought to be represented on the Conservancy Board.

Mr. PEMBER: If interest in the purity of the water is, as I take it, the reason of your asking to be represented, by parity of reason, why should they not be upon the Board too?

Witness: There is another important interest they have—that is, decreasing the quantity of water in the river; and it would be more politic if they were omitted from the body.

I will put the argument *ad hominem* to you as you put one to me. You intend to buy the Companies' undertakings as cheap as you can, do you not?—Yes, of course.

And you would, if you could, make their supply insufficient for London? Undoubtedly.*

Therefore one of your first objects, when you got on to the Board, would be to get rid of the agreements which you think you could get rid of as *ultra vires?*—If they are legal, they are legal; if they are illegal, they do not stand.

They could get rid of them if they were illegal?—We should be compelled to do so.

The CHAIRMAN: It would be a question of discretion.

Mr. PEMBER: The question of discretion would be exercised by a partisan.

The CHAIRMAN: These agreements are perpetual.

Witness: Yes.

The CHAIRMAN: Is there any way of terminating them?

Mr. PEMBER: No.

The CHAIRMAN: Both sides are bound for ever.

Mr. PEMBER: The phrase is: "So long as people are able to draw water from the river."

Mr. KIMBER: The question is whether they can take more than a certain quantity.

Mr. MOULTON: There are limits in their Acts.

Mr. PEMBER: There is nothing in any of the Thames Conservancy Acts limiting the quantity of water the Companies may take from the river. What limitation there is is in the Acts of the Companies themselves; and they are limited by those to 20, 25, and 10 millions, and so forth, a day without the consent of the Conservators.

Mr. BARRAN: Where does the right of riparian owners come in, if consent is given by the Conservancy Board to take a larger quantity of water than the Acts of Parliament sanction.

Mr. PEMBER: That is a point of law upon which I should shudder from giving any opinion.

In further cross-examination by Mr. PEMBER, witness said that the inquiry by the Royal Commission was in a very limited direction—it was merely as regards water supply. It was to report on the capacity of the Rivers Thames and Lea to supply in the future water for the Metropolis with respect to purity and quantity.

Mr. KIMBER: Do I understand that, if the County Council had a representation of seven seats upon the Conservancy Board, you could use your influence to prevent the Board from supplying, through the Companies, any excess quantities of water to the citizens of London?

Witness replied that their primary interest would be to see that the citizens were properly supplied with water; and if the Companies could not do it from the Thames, supposing the Council were not the Water Authority, they would compel the Companies to get it from some other source. By supplying an excessive amount in the height of summer, they lowered the bulk of water which ran over Teddington Lock. At that time, it was necessary for the health of the Metropolis that a proper quantity should come down the river to purify it, so that the dietetic water might be perfectly pure. But there must be left in the river a reasonable quantity to keep up the downward flow of the whole stream; otherwise they would have an oscillating downward mass of polluting water. Were the Council to take an active part on the Conservancy, they would see that some provision was introduced for compensation water. Other towns had to give it; and he did not see why the London Water Companies should be excluded.

Mr. PEMBER: Now we begin to see what you would do to us if you got upon the Board. Of course, everything you can do to make the undertakings of the Companies less valuable gives you a better chance of buying them at your own price.

Witness: Our object is the welfare of the people of London; and we do not care very much for the Companies. You will give us credit for discharging important public duties.

As Counsel for the Water Companies, I cannot; and it is of no use asking me. I put it to you, and you did not deny it, that your object, so long as we remain unpurchased, would be to limit, as far as you possibly could within the four corners of your Acts, the amount of water which we are taking from the Thames?—Subject always to our primary duty to see that London is properly supplied with water. My own individual opinion is that you ought to go elsewhere.

In further cross-examination, witness said the Bill did not propose to give any more money or powers to the Conservancy; and he had no complaint to make as to the way in which the Board had discharged their duty—believing they had done the best, within their financial powers. With a larger representation, he thought they might get extended money powers; but these must be given by Parliament.

Mr. PEMBER: Does it not strike you that the thing ought to be considered in one great measure by Parliament?

Witness: I think the sooner the better.

Mr. BENN: Supposing that, in the future, the Thames Conservancy were tempted to consent to a larger intake on the part of the Water Companies, which might be prejudicial to the population, do you not think the representation sought by the County Council would tend to check any such proceeding?

Witness: Decidedly it would.

* On the following day, the witness corrected this answer, which he said was "obviously incorrect;" and he added: "I must have misunderstood the question of the learned gentleman, because such an answer as that is absurd, coming from me. 'No' is the proper answer."

Friday, April 14.

Prior to proceeding with the consideration of the Bill in public, the Committee held a private consultation. At its close,

The CHAIRMAN said: The Committee have decided that, except upon one point, they require to hear no further evidence for the promoters, and that point is as to the populations of the other counties below what I may call the lower River Thames—*i.e.*, Middlesex, Surrey, and Essex. Except upon this point, as at present advised, and reserving their right to ask for further evidence at a later stage, they require to hear no more evidence from the promoters.

Mr. LITTLER pointed out that the cross-examination of Mr. Binnie had not been concluded; and that this might possibly alter the views of one or more of the Committee. The opponents would maintain that no case had been made for alteration, at all events by this Bill.

Mr. *Binnie* was then further cross-examined by Mr. LITTLER as to the statement made to the Royal Commission on behalf of the Thames Conservancy, which dealt with the question of purity as well as with the supply; and Mr. Littler stated that they were prepared to go into the whole question if the Committee thought it necessary or desirable. Examined as to whether, when the Thames Conservancy came to Parliament in 1864, in 1867, and in 1870, the Metropolitan Board of Works had not sought to gain representation upon the Conservancy Board, and that their claim had been rejected by Parliament, witness said he did not know it as a fact, but it might be so. He was not aware that the County Council had had any memorial addressed to them to take up this question; but if there had been, he would not be cognizant of it, as it would not come into his department.

Mr. LITTLER: Now I will ask you a very bold question. What interest have you in the river, so far as the river itself is concerned, which is not shared by every County Authority above and below it?

Witness: There is a very important question, which is rather excluded by the ruling of the Committee yesterday, that the great bulk of the people in London have to drink the water of the Thames. Therefore the Council think it is reasonable that they should be represented on the governing body of the river—not that we allege that the governing body is not doing its duty up to the fullest of its ability.

Those above and below you are also interested in the water of the Thames?—To a limited extent, compared with the Metropolis.

Limited by the number of the inhabitants?—When I take the bulk of the inhabitants of London, and compare them with the others, they are insignificant.

Your case before the Royal Commission is that you should have the control of the water supply; and if you had that control, you would have the power that the Water Companies have of calling upon the Conservators to purify the water?—Yes; so far as they can.

Is it not the fact also that, if your advice is followed, they would cease to use the Thames for drinking purposes?—At a comparatively remote period; for it will require many years before the transfer is effected.

It will no doubt take a long time; but your view is that it ought to cease, as a source of water supply?—There are risks attending the supply which ought to be avoided.

If this Bill were thrown out, would any human being in London be a penny the worse?—I think it would be much better if the Bill were passed. It is not to be measured by money, nor is it a money question.

Whether in money, time, or grievance, or anything else, would anybody be a fraction the worse if this Bill were rejected now?—Not from a money point of view.

Is there any practical grievance which this Bill remedies?—Yes; it vests the control of the river in the hands in which it ought to be.

I ask you about *practical* mischief. Our contention is that, if this is to be done, it should be carried out on some more consistent scheme, with representation for all persons interested, if anything is wanted, which we deny. You cannot give by your Bill those theoretical improvements which you propose, so as to do justice to everybody?—Not immediately by this Bill, no doubt; but it is to be hoped that improvement would take place in the future.

Suppose you obtain your seven representatives on the Conservancy Board, is there any one thing they could do that the Thames Conservancy are not doing now?—No; not under the present Bill.

Witness was cross-examined by Mr. PEMBROKE STEPHENS, on behalf of the County Council for Surrey; and he elicited the fact that the latter body had 28 miles of frontage to the river, as against 20 miles of the London County Council. The river water was also consumed by a large population in Surrey; and there were four Water Companies having their intakes in the Surrey Council's district.

Mr. PEMBROKE STEPHENS: The Surrey County Council therefore have a vital interest in the purity of the water within their own limits of supply to their own population.

Witness said this was so, as far as their population went; but, though the water at the intakes was taken within the county of Surrey, it was consumed most largely within the Metropolitan area. There was no exclusive claim in this respect by the London County Council; they did not claim the whole of the river.

I am dealing with the special claim put forward by London. There is one point, is there not, in which London is distinguished from the other localities—that is, that you send into the Thames a very large quantity of sewage?—We do.

The object of the Thames Conservancy Acts is to prevent this being done anywhere else?—Yes, one of the objects.

And it is the object, among others, which you emphasize when you want to get representation upon the Thames Conservancy?—As we want to drink the water, we would like to know something about the treatment of the sewage, not only in the Conservators' district, but outside it.

But at the same time it happens that the County Council of London have a special power of using the Thames as a drain?—Below the intakes of the Water Companies, because it is not potable water. It is not exclusively done by London; it is very largely done up the Thames.

Suppose we were dealing, not with London, but with any ordinary case, should you say that the people who use a stream as a drain were the best people to choose its conservators from?—It would entirely depend upon whether the people also drink the water. If they do, I think they are the proper persons to conserve the river.

Do you not think there might be a difference of interest between the people who wish to conserve the river in the ordinary sense, and those who want to use it as a drain in the extraordinary sense?—The only possible danger that your question leads me to imagine is this: Supposing the same body was the Water Authority and the Conservancy Authority, they might neglect their conservancy duties, or perform them improperly, and take the contaminated water.

Cross-examined by Mr. WORSLEY TAYLOR, on behalf of the Middlesex County Council, witness admitted that this body was entitled to have a voice in the water question; that they had 25 miles of river frontage; and that all the intakes of the Water Companies on the north of the Thames were within their limits. He was not aware that, being thus interested and entitled to representation, the London County Council had consulted them on this question; but no provision was made in the Bill for their representation.

Mr. MOULTON said he had witnesses on behalf of the watermen of the Thames, who were anxious to give evidence; but after the announcement of the Committee, he did not propose to call those witnesses. Subject to the statistics of population being proved, this would conclude his case.

Mr. LITTLER then addressed the Committee on behalf of the Thames Conservators; urging that, though on technical matters, or those involving skilled scientific evidence, Mr. Binnie might be a valuable witness, yet on questions of policy he could not conceive of a worse one. He pointed out that, on several previous occasions, Parliament had refused to give the Metropolitan Authority representation on the Conservancy Board; and as they were not the Water Authority at present, they had no claim to the representation. On the question of the supply, he maintained that the Conservators had done all that was possible—a fact which was even admitted by Mr. Binnie. To increase the *personnel* of the Board would not enlarge their powers, enable them to appoint additional inspectors, or do anything beyond what was at present done. As to the complaint that the Conservators allowed too much water to be abstracted from the Thames, this was not true. The water was taken under agreement; and these agreements had been recognized by Parliament, who had imposed upon the Water Companies the payment of larger amounts for the water they took. The County Council sought to have control over the river, and of the intakes of the Companies beyond their jurisdiction; but why should they have this when neither Surrey nor Middlesex, in which counties the intakes were situated, had any voice in the matter?

Mr. BALFOUR BROWNE then addressed the Committee on behalf of the Corporation of West Ham, and claimed that, if the London County Council were entitled to representation, so also was West Ham, which was quite as much interested in the purity of the river as that body. West Ham had no complaint to make of the Thames Conservancy; but, if it was to be reconstituted, he maintained that this should be done by a public rather than by a private measure, and that all the interests should be represented in the reconstituted body.

Mr. WORSLEY TAYLOR, for the Middlesex County Council, contended that the affirmative case of the promoters had failed, and that the omission of the London County Council from the Conservancy Board was part of a well-considered system laid down by Parliament. The case of the Middlesex County Council was that they were content with the present constitution of the Board; but, if it was to be altered, they claimed that the rights of Middlesex should be represented.

Mr. PEMBROKE STEPHENS, on behalf of the Surrey County Council, said this was a distinctly selfish measure of the London County Council; and it did not find, from one end of the river to the other, a single supporter. He asked the Committee to reject the Bill.

Mr. H. C. RICHARDS, for the Essex County Council, and Sir GILBERT EAST, as a riparian owner, also addressed the Committee in opposition to the Bill.

Monday, April 17.

On the reassembling of the Committee to-day,

Mr. *Binnie* was recalled, to produce statistics of the populations of the areas within the jurisdiction of the Conservancy Board and in the watershed of the Thames.

Mr. POPE then addressed the Committee on behalf of the associated Water Companies. He said that, while he could perfectly understand the simplicity of the proposition that the London County Council sought to have conferred upon them by legislation the right to nominate seven members on the Conservancy Board, he could see most manifest inconveniences in this being enacted, *simplicitur*, without the consideration of other interests and other matters which equally required re-adjustment. The effect of putting upon the Board seven members of the Council, however desirable it might be that such should ultimately be the case, must, of course, immediately increase the number of that body—a paid body—from 23 to 30, and inevitably equally disturb the proportionate representation of the other interests at present there. Supposing they were to come to the conclusion that it was desirable that the Board should be a more popularly representative body than at present, and assuming that Parliament should be advised to assent to the general proposition which Mr. Binnie had put forward as his main argument—viz., that, inasmuch as the population of London had to drink the water, they ought to be represented upon a body which might exercise some control over the purification of that water—how would it be possible for Parliament to resist the claim of Kent, Essex, West Ham, Twickenham, or Richmond, who had, not perhaps in the same proportion, but in principle, exactly the same interest in the purification of the river? If it were done piecemeal in this way, the result would be to make the Conservancy, which had been fixed at 23 members as a workable and convenient number, into an unwieldy body. He asked if it was a convenient thing that this should be done hastily, and upon a mere sentimental idea on the part of the London County Council that they ought to be represented. Looking at the matter as a legislator rather than as an advocate, he said he was not unimpressed with the notion that the Council, as representing the water consumers, might have some interest in the maintenance of the purity of the river, from which the present supply was derived. But, if he were dealing with it as a legislator, he should ask himself: Is there any special reason why this question should be pressed forward in this form, and at this particular time? Nobody could doubt for a moment that it was the most awkward way of dealing with it. The true way was not to pass the Bill, but for the Committee to present a special report, which might lead to future action on the part of the Board of Trade or a public authority to bring forward the whole question for complete discussion. There was no grievance at present complained of; and it was not pretended that the Thames Conservancy did not do their utmost to discharge their duty with the powers and funds they had. This Bill did not provide further funds, or give fresh powers; it simply proposed to "pitchfork" seven new members into the constitution of that body. The radical defect of the proposition was that it must, of necessity, be partial; it could not possibly be complete. It did not give them power to deal with the whole question, but simply prejudiced the principle of popular representation without the slightest adjustment of the proportion due to the respective interests involved. On behalf of the Water Companies, he asked himself this question: What motives can there be, beyond mere sentiment, why this matter should be pressed now, and in this manner? He could see plenty. The Royal Commission, which it was hoped would shortly make their report, would no doubt give information in regard to the Water Companies which might or might not be conclusive as to the views entertained by the County Council upon this matter. The Council was a body which had avowed the policy of dealing with the Companies in a certain way, so far as possible to cheapen the property which ultimately they might have to purchase. The Thames Conservancy had since 1886 been charged with the question of river pollution; and, without considering any other interests, he did see a motive why the Council should desire to put into the body having such control, a number of their representatives, who might introduce an element very hostile to the undertakings they desired to depreciate, and ultimately to purchase. Therefore he wished emphatically to represent to the Committee that it would be most unfair and unjust to the Water Companies to deal with this matter without giving them a fair opportunity of saying to the Committee, "We, the Water Companies, are equally interested with the consumers in the purity of the stream, and we ought to be represented as much as the consumers upon the body which has to control our source of supply; or, at all events, proportionately to the consumers who in future may be entitled to that representation." Not one syllable had been uttered derogatory to the water supply. All this had been most carefully gone into before the Royal Commission. Mr. Binnie very frankly put in the forefront the mere suggestion that, as the population of London drank the water, they were entitled to representation upon the body which controlled its pollution; and while he (Mr. Pope) did not argue for a moment against that, he said it was only an incomplete argument, on which legislation ought not to be founded piecemeal. Independent of the general question, the Water Companies were entitled to say: "Do not place upon this governing body those who are avowedly hostile, who have a policy to pursue, who, with perfect honesty and good faith, and with perfect regard to what they deem to be their duty to their constituents, must press forward their own convictions, without giving to those interested a right, and an effective right, to ask that they should be protected by being equally represented on the Board." If the Committee declined to deal with the matter piecemeal, as in this Bill, and recommended that it should be treated as a whole in a special report, he, on behalf of the Water Companies, would withhold any further observations until the Committee should discuss the whole question upon that special report.

The CHAIRMAN said the Committee would go into the case of the Lea Conservancy before announcing their decision as to the Thames.

Mr. MOULTON then proceeded to open the part of the case relating to the proposal to increase the representation of the London County Council on the Lea Conservancy Board from one to three members. He stated that the Board was constituted in 1868, and had not since been changed. Five of the members were elected by the riparian owners; four, by the New River and East London Water Companies; and one each by the London County Council, the Corporation of London, owners of barges used on the river, and the heads of various local authorities. The River Lea was a most important source of water supply to London; and the quantity of water drawn by the two Companies named was so great that, although the Conservators had a right to have a certain minimum amount of water passed down the locks, so as to constitute the stream of the river in summer, they were unable to take, he believed, more than one-third of that to which they were entitled, because of the enormous drain upon it. In the constitution of the Board, the Water Companies were obviously very powerfully represented; and the riparian owners must, to a very great extent, represent those parts of the river above the intakes, whose rights were not affected in any way by the division of the water between the stream and the Water Companies below the intakes. Consequently, a large proportion of the members of the Board were not vitally interested in the condition of the river either at the intakes or below. For similar reasons to those put forward in respect to the Thames, the London County Council's representation was, as he contended, too small; and he repeated that the opposition would also be much on the same lines. All that had passed as to the Thames Conservancy strengthened the position he took up with regard to the Lea.

The CHAIRMAN asked if the learned Counsel could inform the Committee as to the functions of the Lea Conservancy.

Mr. MOULTON said they had all the powers possessed by the Thames Conservancy; and the quality and quantity of the water as well as the navigation, were all protected by the Act. In a Bill promoted in 1890, in which application was made for two extra representatives by the London County Council, the House of Commons granted one extra, but the Lords rejected the proposal. In 1867, the Water Companies drew 38,000,000 gallons per day from the Lea; and in 1891, this quantity had been increased to 66,000,000 gallons—leaving a very small margin of flow. The Companies paid altogether £4500; and the receipts from tolls on the river came to about £14,700. The quantity of water to which the Conservancy were entitled was 5,400,000 gallons per day; but, owing to the great drain upon the river by the Companies, they, although they had a prior right, only drew about one-third and the Companies took all the rest.

Mr. *T. H. W. Idris*, Chairman of the Main Drainage Committee of the London County Council, and the representative of that body on the Lea Conservancy, was then examined by Mr. MOULTON. He said he regarded the representation of the Water Companies upon the Board as very powerful; but they were interested in the purity of the water higher than the intakes. The towns above did not pollute the river very much, though there was still some pollution which ought to be stopped. The Companies drew almost the entire flow of the river; and the main danger was that it would be converted into a lake of sewage below the intakes. It was very important that the flow of water should be kept up in the interests of the health of the population on its banks; and the County Council were most anxious to promote in every possible way the purity of the water in the Lea.

Mr. PEMBER asked where the section giving the Lea Conservancy the right to the 5,400,000 gallons per day was to be found.

Mr. MOULTON referred to the 33rd section of the Act of 1855.

The CHAIRMAN said the Committee would require to be satisfied as to the absolute right to the 5,400,000 gallons claimed on behalf of the Conservancy.

In cross-examination by Mr. LITTLER, witness said that the proposition had not been brought forward with any consultation with, or even with a request for an expression of an opinion from, the Lea Conservancy Board. One of the principal complaints had been with regard to the Tottenham sewage; but since 1890 this had been removed by diverting the effluent into the London County Council's main drainage system. This was done in consequence of the pressure brought to bear upon the Board by the Council, and of communications between them and the Tottenham Sewage Board. The views of the Conservators were almost entirely in the interests of the Water Companies. In order that the Companies might take nearly the whole of the flow of the Lea, expensive dredging works had been carried on by the Conservancy Board, to enable them to avoid taking the water to which they were really entitled.

Mr. LITTLER: In point of fact, is not this a desire to get control over the Lea before the Water Commission make their report?

Witness: No; it is not. It is simply a desire to get an improvement in the purity of the Lea in the interest of the inhabitants.

But, in order to do that, you must reduce the quantity of water which the Companies take?—It must be obvious that, when the whole flow of the river is taken by the Companies, not sufficient is taken by the Conservators to maintain the purity of the water.

In further cross-examination, witness was asked why West Ham should not be included in the Bill, and also be represented on the Board. In reply, he said the interests of West Ham were directly antagonistic to those of London. The County Council were spending enormous sums, and not stinting any expense, in promoting the purity of the Thames and the lower part of the Lea. The West Ham Corporation were, however, putting about 4,000,000 gallons of practically untreated sewage into the lower portion of the Lea; and the good that was done by spending freely the money of the inhabitants of London was to a great extent neutralized by this pollution. Stricter provision would prove that West Ham was not entitled to do that.

The CHAIRMAN: Have you ever raised the question of the action of the West Ham Corporation on the Board?

Witness said he had; and they were in negotiation with the Corporation to take the sewage into the County Council's system, as had been done in the case of Tottenham.

Mr. KIMBER: Can you say that the West Ham people are doing anything they ought not to do, or failing to do anything they ought to do, by reason of your not being able to bring sufficient pressure upon them? Are they attending to your representations?

Witness said that, to his mind, the Conservancy were not bringing as much pressure to bear upon them as they ought to do.

If you had three members on the Board now instead of one, what would you do with regard to the specific question of West Ham that it is impossible for you to do now?—They could move and support a resolution calling upon West Ham to cease polluting the Lea.

Mr. LITTLER: The Water Companies' representatives clearly have no interest in sending down polluted water, have they?

Witness: No; but the West Ham pollution would not be so bad if the 5,400,000 gallons were taken by the Conservancy.

Cross-examined by Mr. PEMBER, witness stated that he had only had official cognizance of the affairs of the Conservancy for about eight months; but he knew, from figures which were brought under his notice, and from inquiries he had made as to the condition of the Lea, that the Water Companies did not leave the requisite quantity for the navigation. If the Conservancy required the whole 5,400,000 gallons for the navigation, they were entitled to take it. But they need not do so unless they chose; and if they did not, the water belonged to the Companies.

The CHAIRMAN: You do not admit any duty to keep up to the 5,400,000 gallons?

Mr. PEMBER: No; they are only entitled to take as much as they want.

Witness said that, since he had been on the Conservancy Board, representations had been made to the Water Companies that they must contribute a larger amount, in order that the Board might proceed in the course hitherto pursued—that is, leave as much water as possible; and the Companies recognized that position.

It comes to this—that the Companies say: "We will give you more money if you will made arrangements by which you can do with less water"?—Yes.

Do you put that to the Committee as being an objection on the part of the Companies to the Board taking their proper share?—It is an arrangement, and has the same effect as an objection.

Since you have been on the Board, have you received any complaints, from those interested in the navigation of the Lea, that enough water for this purpose was not sent down?—I do not remember any specific complaint in my time.

In cross-examination by Mr. WORSLEY TAYLOR, witness stated that he did not agree with the rest of the constitution of the Board, and thought the population should be represented.

Cross-examined by Mr. RICHARDS, witness expressed the opinion that Essex should be represented in proportion to its population.

Replying to Mr. CLAUDE BAGGALLAY, who cross-examined on behalf of West Ham, witness stated that Major Flower, the Engineer of the Lea Conservancy Board, had expressed his satisfaction with what the West Ham Corporation were doing with regard to their sewage; but witness did not agree with him.

Tuesday, April 18.

Mr. *Idris* was to-day further cross-examined by Mr. CLAUDE BAGGALLAY as to the claims of West Ham to be represented upon the Lea Conservancy Board, and as to the difficulty of dealing with the sewage of the borough. He said the tributaries of the Lea at times brought down the water very rapidly from the watershed; and the control of all the sluices, weirs, and locks upon the various rivers was invested in the Board. If anything were not done rightly as to the management of the locks, sluices, and weirs, the place would probably be flooded. West Ham was thus not only interested in the Lea itself, but in the tributaries under the jurisdiction of the Conservancy.

Cross-examined by Mr. BALFOUR BROWNE, witness said it was not partly with a view of taking away the preponderating influence of the Water Companies that he desired to reconstitute the Board; the only object of the London County Council had been to ensure greater purity in the lower portions of the river. If the pollution at Old Ford were prevented in the future, and the West Ham people had their sewage taken down to Barking, their object would still not be secured without reconstituting the Board, because a fair proportion of fresh water was always required to scour the bed of the river.

Correspondence was read between the Water Companies and the Conservancy Board as to the abstraction of water and its effect on the navigation, including the resolution of the Board that, whenever the water in the Limehouse cut was below head, and the navigation required it, sufficient should be passed down the river from the reaches above for the purposes of the traffic—not exceeding in any one day the quantity reserved to the navigation in priority by the Lea Navigation Act of 1855.

Mr. PEMBER asked what more the Conservancy could have done than this.

Mr. FREEMAN replied that this was done only on one day, and never effectually.

Mr. PEMBER said the correspondence showed that, so far from the Conservancy Board not having discharged their duty, they insisted that the proper quantity of water should be passed down the river.

Mr. *A. R. Binnie* was then recalled, and gave details as to the area and population in the Lea watershed; stating that there were 2,000,000 people in the area of the County Council who were supplied by the New River Company. He had frequently observed the condition of the river, and considered that sufficient water was not being furnished to maintain its purity and the navigation. In the summer, the water in the Limehouse cut became stagnant and offensive, and unhealthy to the people dwelling in the neighbourhood. The statutory quantity of 5,400,000 gallons was not sent down.

The CHAIRMAN: At what point on the river are you entitled to this 5,400,000 gallons? We have never yet arrived at that.

Mr. FREEMAN quoted from the Act of 1855, showing that they were entitled to the 5,400,000 gallons through all the locks from Waltham town lock exclusive down to and including Old Ford lock.

Witness said the agreement by which the Conservators received from the Water Companies a money payment in lieu of the water, was one of the gravest objections the County Council had to the present management of the Conservancy Board. As to the pollution from the West Ham sewage, there was no engineering difficulty in the way of dealing with it—in fact, the Engineer of the West Ham Corporation and himself had met and agreed upon a joint scheme for effecting the purpose; and they had submitted it to the respective Boards.

Cross-examined by Mr. BALFOUR BROWNE, witness said the petition of the County Council suggested that the way to remedy the sewage difficulty of West Ham was that the borough should be absorbed in London. He was not aware that the river was perfectly pure above the point where they sent in the storm-water overflow. He had seen it in a very foul state above Old Ford since the Tottenham sewage had been dealt with; but he did not know what amount of water was going into the lower reach of the river which was not taken by the Water Companies.

Cross-examined by Mr. CLAUDE BAGGALLAY, witness said that, though he complained of the preponderating influence of the Water Companies on the Board, they only had four members; but the influence on the body did not always depend upon the number of the members. The New River Company supplied a small quantity of water for non-domestic purposes from their surface collections at Hampstead; and the East London Company had a very large storeage reservoir in the valley of the Lea. He believed they had a 21 days' supply for London.

Mr. BAGGALLAY: Therefore it is a fact, is it not, that in dry weather they do not have to draw from the Lea the full quantity they might otherwise take.

Witness: They do not; but, as that "full quantity" is not sufficient for them, they make up the deficiency from their own reservoirs.

Cross-examined by Mr. GIBSON, for the Essex County Council, witness said the London County Council were desirous of obtaining the control of the water supply; but whether it would take the form

of purchasing the works, or some other form which Parliament might devise, he could not say.

Mr. GIBSON: And assuming that you do buy them up, would it then be to your interest, so long as you supply your water from the Lea, to send down more water for the purposes of navigation?

Witness said he was sure it would be to the interest of the Council to preserve the cleanliness of the Metropolis as a whole; and not the cleanliness of the river only, whether the Thames or the Lea, but also to supply the inhabitants with a proper quantity of drinking water. They had no pecuniary interest in doing anything else. He thought the River Lea was nearly exhausted as a source of water supply. In proportion to their population, Essex and other areas bounding the Metropolis were similarly interested in the matter to London.

Mr. MOULTON said he understood that Mr. Corble, the Clerk to the Conservancy, was to be called; and as he could prove the quantity of water withdrawn by the Companies and that which was sent down the river, he did not propose to produce further evidence.

The CHAIRMAN: Your case is that, as things are, the consumers of water and those interested in the navigation, do not get their 5,400,000 gallons daily in that particular portion of the Lea which lies between Waltham lock and Old Ford. We are totally without any evidence upon that point.

Mr. MOULTON quoted the following extract from the statement of the Lea Conservancy Board to the Royal Commission: "Considering the large quantities of water taken by the two Companies from the River Lea, and the altered circumstances since the rents were fixed in 1855, the Lea Conservancy Board are of opinion that the payments made by the Companies to the Lea are insufficient and should be increased. Other reasons for this are that the abstraction of so large a quantity of water does not leave sufficient to keep up the navigation head levels, especially in the lower reaches of the river. More money has to be expended in dredging than was done in former years, to enable barges to pass. The Board have the prior right to pass down the river, for the purposes of navigation, certain quantities of water, as set forth in section 11 of the Act of 1855; but were they to do this regularly—and the traders have frequently demanded it—the Water Companies' supply would fall short. The navigation never takes anything like the reserved daily quantity."

Mr. KIMBER questioned witness as to how the difficulties about water and sewage would be removed by having two more members on the Board, when they could not be remedied with their present representation; and he suggested that the policy of the County Council was to cripple the Water Companies, so that the Council would have less to pay if they bought up their undertakings.

Witness said this was not their object, but to maintain the purity of the rivers. These were the important duties of the Conservators of both rivers; and the Council were of opinion that those duties were being neglected in the interest of the preponderating mass of capital of the Water Companies.

This concluded the case for the promoters.

Mr. BALFOUR BROWNE said, before addressing the Committee, the more natural course, as representing the Conservancy, was to hear what was to be put forward by the other Local Authorities—the County Councils of Middlesex and Essex—with regard to the reconstitution of the Board. His opinion was that the promoters had not made out any case for reconstitution. But, of course, there had been a little "dirt" thrown; and he was bound to call some evidence to clear it away.

Mr. *E. Rider Cook*, Chairman of the Lea Conservancy Board, was then examined by Mr. GEDGE. He said he had been a member of this body, for eleven or twelve years. In settling the constitution of the Board in 1868, the object was to include all the interests affected. It was appointed for the proper management of the Lea, having regard to it as a source of water supply and as a stream passing through the Metropolis; there being seven representatives of the navigating, as opposed to six representing the water and sanitary interests. The work had proceeded smoothly and harmoniously. They had done their best to manage the river, and had taken action at various times with regard to pollution. As to the Old Ford outlet, they had urged upon the Metropolitan Board of Works rather to do away with the storm outfall or, if they could not do that, at any rate to use deodorants and disinfectants, so as to minimize the evil of pouring the sewage into the Lea. Nothing had been done until within the last twelve months, when they were informed, in a letter from the London County Council, that some steps had been taken, but they had been unable to obtain any information as to whether the disinfecting or deodorization which had been going on was efficient or merely nominal. Having business upon the banks of the river, he should say, from his own observation, that the deodorization had been formal and nominal, and had not been, in any sense of the word, efficient, as the influence of the storm outfall upon the lower part of the Bow river, after it had been in action, was visible to the eye and most palpable to the nose. He differed entirely from the evidence of Mr. Binnie. When the stuff came out, when the storm outfall was in action, it was not diluted, but concentrated sewage. As the storm water came down, it stirred up the sediment which had been deposited in the sewer. The fall of the sewer was very slight—being only one foot a mile in some parts; and while there was a sluggish flow of sewage, there was a large sediment in the sewer. When a storm came, the water rushed down, and stirred up all this sediment, and it was poured into the Lea in a black and foul condition.

The CHAIRMAN: Have you not power to compel the London County Council to increase the outflow?

Witness: I do not think we have; but, not being a lawyer, I cannot speak positively.

In the course of further examination, witness said, as to the suggestion that an agreement had been entered into with the Water Companies, allowing them, in consideration of a money payment, to take from the river more water than they ought to do under the Act, Mr. Idris must have dreamt or imagined something that never took place on the Board. He said most solemnly that there never was a suggestion about the quantity of water in relation to the extra amount of money the Companies were to pay. The matter arose in connection with the revision of the tolls; and it was urged that, if they taxed the traders to a larger extent, they ought also to get an increased contribution from the Water Companies. They were in debt £6000, owing to the Hereford purification suit; and they felt they had a reasonable claim upon the Companies, in whose interests they primarily conducted that suit, to a larger contribution, to enable them to get out of debt, and to set aside £1500 a year, as required by the statute, for a sinking fund. He was instructed by his colleagues to negotiate with the Companies, as they were going to tax the traders more heavily, to ask them to increase their contribution for the quantity of water they took from the river. The result was that the Companies agreed to give an additional £1500 a year. As a matter of fact, there was more water, on an average, flowing over the weir at Lea Bridge than was taken by both the Water Companies; and this ran into the Thames. At the present moment, after a long drought, there were 80,000,000 gallons of water a day passing down; and in 1891, which was an excessively dry year, the average quantity was 70,000,000 gallons—that taken by the Water Companies being 56,000,000 gallons. The subscription of £1500 was not in any sense a condonation of the previous increase in the intake of the Companies, but a compromise to prevent the necessity of applying to Parliament for an additional contribution.

Mr. BARRAN: Has it ever been suggested to the Conservancy Board, or to the Water Companies, that, if larger storeage reservoirs were provided, you might overcome the difficulty of impurity by keeping the flow more equal?

Witness said he did not think the question had ever arisen, because, in their visits up the River Lea, they had seen the water pouring over the weir at Lea Bridge; and it continually did so in a steady stream, and ran to waste into the Thames. It did not go near the Limehouse cut; but this had been kept full to the brim for the last two years.

Mr. MOULTON cross-examined the witness as to the correspondence that had taken place with the Water Companies, and the statements the Conservancy Board laid before the Water Commission; and he explained that they were put forward with a view to making the most of their case, so as to get a little more money from the Companies.

Mr. *G. Corble*, Clerk to the Conservancy Board, next gave evidence. He said they had been continuously in correspondence with the Metropolitan Board of Works and the London County Council, and had served notice on the latter body calling upon them to discontinue any flow or discharge of sewage or offensive matters from the outfalls into the river, under section 92 of the Act of 1868; but the Council contended that, under section 106, their power was reserved to sending in their storm waters. He contended, however, that they had no legal right to discharge sewage.

Mr. GEDGE remarked that it seemed doubtful how far the Board could or could not stop it; and in previous litigation it had been found to be not an easy matter to decide.

Witness said that at recent meetings the Old Ford pollution had constantly cropped up; and this was now the principal pollution, except the West Ham effluent. It was considered by the Conservators that the increased representation of the County Council on the Board would give them so much more power in directing their policy.

Mr. *Binnie* was recalled in regard to the pollution from the storm overflow. He denied that the Council ever carried concentrated sewage into the river. The first effect of heavy rain was that the sewer brought down the workings of the collateral sewers which fed the main outfalls, and towards the end of the storm, the culverts became filled with water, and must overflow. The water that came out was very highly diluted sewage, which in a few hours was scoured out by the upland flood coming down. Were the Conservators to put in action the legal powers they claimed to possess, the only effect would be to blow up the whole system of sewerage in the Metropolis.

Wednesday, April 19.

Mr. BALFOUR BROWNE, addressing the Committee on behalf of the Lea Conservancy, said the onus of the case was on the promoters of the Bill, whose Counsel had dealt at length with the question of the Thames Conservancy, and then claimed that the same considerations applied to the Lea. This view, however, was entirely erroneous, as not one of them applied to that river which applied to the Thames. Only a comparatively small part of the population of London were interested in the Lea, and they only to a certain extent in connection with the water supply. The constitution of the Board was not decided upon until after four inquiries before Committees; and the underlying principle of the Act was that every interest upon the river should be fairly represented, but that the primary interest—that of the navigation—should have a preponderant voice. This principle was right then; and it was so now. The second interest was, undoubtedly, the right of the population living along the banks of the river to drink its water; and Parliament had allowed certain Water Companies to take water from the river for the purpose of drinking. The least important interest was that there should be water in the river to dilute any impurity that might be coming down. The whole case of the London County Council, if they had any, was a desire to keep the water in the river, if possible, to dilute something which ought not to be there at all. That purity, as a matter of health and of sanitation, was important, he thoroughly agreed; and it seemed to him that the policy of the Council to waste pure water in diluting sewage was one of the most ridiculous that was ever thought of. They did not want those nasty things in the river. They ought not to be there; and if they were not, there would be no complaint of the diminution of water for mere diluting purposes. Over and over again, the Board had protested against what the Council were doing at Old Ford; and he maintained that, under the Act, they were guilty of a misdemeanour in putting the sewage into the river there. It was a very serious matter for a Board which was not wealthy to take proceedings against the County Council; but, at the same time, the Council were the only persons, except West Ham (and that was about to be remedied), who were causing any pollution of the river at all. They surely could not rely upon their own wrong to say: "We are doing wrong, therefore give us some further representation on the Board;" and it might be, as suggested by one of the Committee on the previous day, that their object in increasing their representation

was in order that the Board might not take the necessary steps to prevent them fouling the river. The remedy was for them to cease putting the sewage into it, and not by increasing their representation. This was not a question of the *bonâ fide* reconstitution of the Board, but was part of a great campaign against various interests. It would strengthen their hands against the Water Companies; and it was their ambition to coerce the Companies into selling at a price which might possibly mean disaster to the shareholders. He asked the Committee not to grant parliamentary powers for such a policy and for such a campaign. There was no complaint against the action of the Conservancy, and no demand for legislation, except in the "vaulting ambition" of the County Council, which he hoped would in this case "o'erleap itself."

Mr. PEMBER, on behalf of the Water Companies, said he did not propose to call witnesses, as it was not a question of evidence but of principle. Referring to the Act of 1855, dealing with the ownership of the water, he pointed out that, with the exception of the quantity reserved to the navigation, all the water of the river was absolutely vested in the two Water Companies for ever, provided that nothing therein contained should give the Companies any right to such water as did not then belong to the Trustees, or as they had not then power to sell. It showed that, subject to the provisions of the Act, the water of the River Lea was practically the property of the Water Companies. They were, subject to certain reservations, the owners of the waters of the Lea in a way that, so far as he knew, very few public bodies ever became the proprietors of water. Therefore it was not to be wondered at that they were strongly represented, though not in a preponderating way, upon the Conservancy Board. It was obvious that the Board was jointly constituted of those who were concerned with the navigation and those who, like the Water Companies, had an interest in the water. It was a composite body with two main objects to fulfil—one being to maintain the purity of the water, and allow it to be taken by the Companies for their purposes; and the other to see that the navigation was properly provided for. The Act did not cast any duty upon the Trustees to send down day by day the quantities of water which had been mentioned. There might be alternative methods of preserving the navigation; and it was open to the discretion of the Board to adopt one or more of them. One was the dredging of the Limehouse Cut. Dealing with the correspondence and negotiations between the Conservancy and the Companies, the learned Counsel maintained that the action of the Board, which had to conciliate all interests, was perfectly justifiable, and that they therefore pointed out to the Companies that to send down the whole of the 5,400,000 gallons of water per day would interfere seriously with the supply, but that, if the Companies chose to assist them with the necessary funds, could be attained by dredging. The County Council, he contended, had no interest in the navigation, but that what they wanted to do was to make the quantity of water insufficient for the Companies. On the question of purity, they had not made out any case against the Conservancy Board. Impurity existed only in the lower reaches of the river, from the Old Ford overflow and the West Ham sewage; and it would not conduce to the purity of the Lea at all to have two more County Council representatives on the Board. It was possible that a time might come when the constitution of the Board would have to be revised—supposing, for instance, the Royal Commission reported in favour of the Thames and Lea as the ultimate sources of the water supply of London; but at present the question was not ripe for settlement. It was certain that nobody was more vitally interested in the purity of the water of those rivers than the purveyors of it, except, of course, its consumers. But why were the purveyors so vitally interested in selling a good article? Simply because they had the duty cast upon them by Parliament of supplying "a full and sufficient quantity of pure and wholesome water to the inhabitants of the Metropolis." This was the essence of their contract with Parliament; and it was not too much to say that they held their parliamentary position upon this tenure. He admitted that the interest of the consumers and their representatives was as great as the Council said; but at the same time he insisted that the interest of the purveyors and the consumers ought to be coincident, and that action on this matter, if taken at all, ought to be taken in concert. Why had not this been done? Not from any feeling on the part of the Water Companies, but simply from the passionate hostility of the consumers' representatives—the County Council—to the Companies. This was why they had gone behind the backs of the Companies, and, without consulting with them as to the best way of improving the constitution of the Conservancy Board, had asked to be shovelled on to these Boards in what was really an overwhelmingly powerful proportion. For many years the Metropolitan Board of Works and their successors, the County Council, had endeavoured to oust the Companies from the supply of water to London; and it had become evident that they could not do this without purchase, upon the ordinary terms of arbitration. Therefore the Council had endeavoured to cheapen and depreciate the Companies' undertakings by every possible means. They had attacked their legal position in the matter of the agreement with the Thames Conservancy; they had also attacked the *quasi*-parliamentary monopoly which the Companies possessed so long as they did their duty and afforded a full and efficient supply of water to the public; and they had also attacked the value of the undertakings, by sedulously vilifying the sources of supply, both as to quality and quantity. Who moved for the present Royal Commission to consider both these points in regard to the Thames and the Lea, hoping against hope for an unfavourable verdict? The County Council. Who, in the face of—he had almost said in spite of—the strongest expert evidence (for he had had the pleasure of reading it all) advanced in favour of the two rivers, had persisted in giving vent to the most heated and inflated opinions against them as sources of supply? The officers of the County Council. The body which was taking up this line and attitude now asked Parliament to put it in large proportions on to the Conservancy Boards, in order to give it an opportunity of turning its accusations and prophecies into facts, to the ruinous disaster of the great undertakings which it had so long and so deliberately set itself to undermine. If this were not the object of the Council—if they really had the common interest of both the purveyors and the consumers of water at heart—they would have acted differently; they would have made one cause with the Companies, as persons equally interested with themselves, and they would have asked for a common representation, and a general reconstruction of the Conservancy Boards. The reason they had not done this was perfectly well known to themselves, and must be obvious even to the blindest of their own partisans. They thought, if they once got on to these Boards, they could do something towards undermining the position of the Companies, without laying themselves open, as a public body, to *mandamus* or injunction—on the Thames Board, by immediately setting to work to see what they could do to set aside the agreements under which the Companies took water from the river; and on the Lea Board, by forcing the Conservators into insisting on sending down a daily quantity of 5,400,000 gallons, which would make the water supply from the river insufficient. When they were there, they could have a place of advantage whence they could resist the further reconstruction of the Board, notably in the direction of giving the Companies their fair representation. For these reasons, he asked the Committee to reject the proposal altogether. It was a piecemeal handling of what was growing into a great question, and such a handling of it as was intended not to further, but to impede, a just and comprehensive settlement.

Mr. LITTLER, speaking on behalf of the Corporation of London against the proposal of the Bill, dealt with the settlement of 1868, constituting the Lea Conservancy Board, and said it was obvious at the time, as Mr. Pember had contended, that the Water Companies were practically the proprietors of the Lea, so far as the water supply not only of London, but of large districts beyond, was concerned; for they must remember that the East London Company, and notably the New River Company, supplied for a considerable distance up the stream. Under these circumstances, it was absolutely necessary that the Water Companies should be represented on the Board. If the unification of London, which he characterized as the "residence of the lamb inside the lion," should take place, and if, in addition to this, the County Council should purchase the Water Companies' undertakings, the result would be that they would immediately have six out of thirteen members on the Conservancy Board; and if they had the addition proposed by the Bill, they would have eight out of fifteen. The Committee could therefore see that the object was to secure an absolute majority on the representation. He contended that, until the Water Commission had reported, it would be idle to commence an inquiry into the reconstruction of the Conservancy Boards, if it should be wanted, which he very much doubted. There was not a tittle of evidence of any misconduct on the part of the Lea Conservancy Board; and he submitted that the application was premature, and ought not to be granted.

Mr. WORSLEY TAYLOR, on behalf of the County Council for Middlesex, urged that the Bill was incomplete, and would be most unjust to those whom he represented. On these two grounds, therefore, it should be rejected.

Mr. RICHARDS, for the County Council of Essex, opposed the Bill on similar grounds.

Mr. MOULTON, in reply, said he had never uttered one word, nor had he put before the Committee any evidence, against the right of other County Councils to be represented on the Conservancy, when they applied to Parliament for it. There could, he contended, be no justification for keeping the large population from having a powerful voice in the control of the rivers. It was of no use saying the Water Companies were interested in the purity of the water. The consumers, especially those who lived in London, were the persons who were most vitally concerned. It was suggested that the County Council were great sinners against purity, because they had their storm overflow, which on certain occasions passed water into the Lea. He maintained that this was ridiculous, and that the action of the overflow resulted in the utmost possible dilution; while he denied that the Council were in any way liable to proceedings by the Conservancy under the Act of 1868 in respect to the overflow.

Mr. KIMBER asked whether any of the investigations or negotiations which another portion of the Bill asked power to make, and to spend money upon, related to the Thames or the Lea.

Mr. MOULTON said they would relate to the Thames or the Lea, whether or not this portion of the Bill were passed. It was a perfectly general clause, and was not opposed.

The Committee having conferred in private,

The CHAIRMAN said: The Committee have decided that the portion of the preamble which relates to the Thames Conservancy representation is proved, subject to the number in the clause following later in the Bill, determining the number of the representatives, being reduced from seven to four. On the question of number, the Committee will make certain observations in a special report which they intend to present to the House. With regard to the Lea Conservancy, the Committee think also that the preamble is proved in this respect; and in that matter they are of opinion that the representation of the London County Council should be three. Observations upon this subject will be also embodied in a special report.

The following is the text of the special report above referred to which was presented to the House last Tuesday:—

Your Committee have gone through the allegations contained in the preamble concerning the need for representation of the London County Council on the Thames Conservancy Board, and for increased representation of the London County Council on the Lea Conservancy Board, and have found the same to be true. In dealing with the clauses relating to such representation, your Committee have fixed four as the number of members which the London County Council are to elect to the Thames Conservancy Board. They have likewise fixed three as the number of members that the London County Council are to elect to the Lea Conservancy Board. Your Committee heard Counsel on behalf of the Middlesex and Essex County Councils and the Borough Council of West Ham in opposition to so much of the Bill as relates to the Lea Conservancy Board, and on behalf of the Surrey County Council, in addition to the other three Councils above mentioned, in opposition to so much of the Bill as relates to the Thames Conservancy. On behalf of all these authorities, it was represented to your Committee that they were satisfied with the present constitution of both

Conservancy Boards, and that they objected to giving the proposed representation to the London County Council, without at the same time giving some representation also to themselves.

County councils are precluded, by section 15 of the Local Government Act, 1888, from promoting Bills in Parliament; and the powers of your Committee in dealing with the present Bill did not enable them to give representation to any riparian authority except the London County Council. Your Committee are of opinion that reasons exist which make it desirable that the London County Council should be represented on the Thames Conservancy, and that they should have increased representation on the Lea Conservancy. They wish, however, to guard themselves against expressing any opinion as to what should be the ultimate representation to be given to the London County Council on either Conservancy in the event of a general reconstruction of the two Boards, or either of them, on the principle of giving representation to riparian local authorities by future parliamentary action. They neither affirm nor deny that the four seats which they have given to the London County Council on the Thames Conservancy, or the three which they have given them on the Lea Conservancy, represent the full share appropriate to be given to the London County Council in such a reconstruction. And they do not wish it to be supposed that the abstract claim of the London County Council to have representation on the Thames Conservancy is any weaker than it was in 1890, when a Committee of this House agreed to a clause giving them five seats on that Board. Your Committee have, however, thought it desirable to exercise caution with regard to the number of seats now allotted to them on either Board, in order that nothing should be done now to make it difficult, in the case of a future reconstruction, to keep within workable limits the total number of the Conservators in either case.

The Gas and Water Works Purchase Question at Goole.—At a meeting of the Goole Local Board last Wednesday, it was recommended that application be made to the Local Government Board for the borrowing of £100,000 for the purpose of completing the purchase of the Gas and Water Company's property. It was further resolved that a competent consulting engineer be appointed, to report generally as to the supply of water in the district.

The Late Engineer of the Huddersfield Corporation Gas-Works.—At the last meeting of the Huddersfield County Council, a resolution was passed determining, by three months' notice, the present engagement of Mr. J. Burgess as Consulting Engineer, and reappointing him at a salary of £150 a year. In moving the resolution, Alderman Stocks stated that Mr. Burgess was suffering from a severe affliction; and it was an impossibility that he would ever go to the works again. He had served the Corporation for a great number of years, and had done very good work for them. His salary had been £500 a year; so that there would be a reduction now of £350.

The New Water-Works for Mansfield.—A communication was recently received by the Mansfield Town Council from the Local Government Board, to the effect that they had arrived at the conclusion that, before they considered the question of the abandonment of the present works, and of granting their sanction to a loan of £25,000 for carrying out experimental works at Rainworth (see *ante*, p. 151), one of the two following courses should be taken—either an eminent geologist who had had practical experience should be consulted as to the prospects of obtaining a greatly increased supply from the magnesian limestone at the site of the present pumping-station, or the actual thickness of the limestone formation at this point should be tested by means of boring, in order to remove any doubts on the question. At their last meeting, the Council decided to consult Professor Lapworth.

The Gas Purchase Question at Bideford.—The Local Government Board have informed the Town Clerk of Bideford that, owing to the opposition to the purchase of the gas-works on the part of a large section of the ratepayers, as well as by members of the Town Council, they do not feel justified in granting the powers applied for by the Corporation. A local paper says that, "upon the receipt of the news, cannons were fired on one of the wharfs at East-the-Water, by ratepayers who had taken a prominent part in the opposition. Great regret, on the other hand, was expressed by those who favoured the purchase, and who are convinced that the acquisition of the gas-works would be a source of profit to the town. In the evening prominent opponents of the purchase paraded the town in a waggonette, preceded by another vehicle containing the Austrian Band. A good deal of interest was manifested in the procession; and the cannons were again fired."

Manchester Corporation Water Department.—The Water-Works Committee of the Manchester City Council will recommend that body at their meeting to-morrow, to levy a domestic water-rate of 9d. in the pound, and a public water-rate of 3d. in the pound, for the purpose of raising the amount required for payment of the expenses connected with the supply of water within the city during the year commencing on the 1st ult. The amount of estimated available rates outstanding on March 31 last, out of a gross sum of £68,359, was £18 2s. 2d.; and of rentals £114 18s. 9d., out of a gross sum of £166,564 14s. 7d. During the year 64,285 fittings have been submitted for examination; and, upon being tested, 61,997 have been approved and stamped. The whole of the reservoirs and works in Longdendale and between Longdendale and Manchester are, the Committee state, in a most satisfactory condition. They are practically as perfect both in construction and working as they can be made. The Thirlmere works are now rapidly approaching completion. The masonry of embankment No. 2, at the outlet of the lake, is now for nearly its whole length up to the coping level; and the coping is being set. The concrete masonry of embankment No. 1 across the river at the outlet is carried up to about 42 feet above the foundation; and the ashlar facing on the lake side has been commenced. The foundation of this embankment had to be carried down to a depth of 60 feet below the river; and the work is now making rapid progress. About one-third of the masonry in the waste-water course remains to be done. It is expected that the whole of the work in this contract, excepting embankment No. 1, will be completed by the end of September.

MISCELLANEOUS NEWS.

COLONIAL GAS UNDERTAKINGS.

We have lately received the reports and accounts of a few colonial gas undertakings, from which we take the following particulars:—

In the six months ending Dec. 31, 1892, the Australian Gaslight Company had a revenue of £201,995 from the sale of gas, which was brought up to £204,108 by the addition of £2113 carried forward. The expenditure in the manufacture and distribution of gas was £127,446; on the lighting and repairing of the public lamps, £7523; and on miscellaneous matters (inclusive of debenture interest, bad debts, &c.) £11,404—making a total of £146,373, and leaving a balance of £57,735. This amount was available for distribution; and the Directors recommended the payment of a dividend for the six months of 9s. per share on the old shares, and in proportion on the fully paid new shares. This would absorb £49,955, and leave £7780 to be carried forward. The Company's Engineer (Mr. T. J. Bush) reports that the plant has been maintained in good and serviceable order. The Company have been making provisions for extending the use of gas for culinary purposes, by erecting a show-room for gas appliances, with a lecture-room adjoining, and by the institution of lectures on cookery.

The Directors of the Brisbane Gas Company, in their report for the six months ending Dec. 31 last, state that, although there was no revival in trade, the Company's business in that period was maintained better than might have been expected. The sale of gas produced £18,926, which, added to a balance of £4008, made a total of £22,934 to the credit of the profit and loss account at the close of the year. The expenditure included £7124 for gas manufacture, £1089 written off plant, £500 placed to reserve, and £1204 for interest. The balance available for distribution is £12,409; and out of this the Directors recommend a dividend of 5 per cent.

According to the sixth annual report of the Directors of the Latrobe (Tasmania) Gas Company, Limited, the Directors state that, owing to the continued commercial depression throughout the colony, the business of the Company has been adversely affected; and consequently the amount to the credit of the profit and loss account on Dec. 31 last was less than might have been anticipated. Many changes have taken place which have tended to reduce the consumption of gas; and economy has been practised by the consumers wherever possible. The reduction made in the price of gas at the beginning of the past year had the effect of reducing the revenue; and the extra duty of 2s. per ton on coal increased the cost of manufacture. Taking these things into consideration, the Directors recommend that a reduction should be made in the usual dividend, and that one at the rate of 6 per cent. per annum should be paid for the second half of last year. The Company's Consulting Engineer (Mr. T. S. Cleminshaw) has maintained the works in good order; and there is no probability of any expenditure being required thereon in the current year. The Manager (Mr. H. S. Wark) carbonized 83 tons 10 cwt. of coal in the six months covered by the report; the quantity of gas manufactured being 803,600 cubic feet, or 9634 cubic feet per ton.

The report which was presented by the Directors to the shareholders of the Launceston (Tasmania) Gas Company at their last half-yearly meeting unfortunately announced that the prevailing commercial depression had been very severely felt by the Company; and, though there had been a satisfactory increase in the number of meters in use in the latter half of last year, the quantity of gas sold had been considerably less than during the corresponding period of 1891. There was consequently a very marked diminution in the revenue from the sale of gas; while the reduction which had been made in the price represented a loss of £430 for the half year. This was a concession, however, which the Directors said it was not their intention to withdraw. The accounts accompanying the report showed a sum of £3450 transferred to profit and loss; the balance of this account available for division being £3609. This was sufficient for the payment of an interim dividend of 5 per cent.; and this the Directors recommended. The quantity of coal carbonized under the supervision of the Company's Engineer (Mr. T. S. Cleminshaw) was 2633 tons of Newcastle, and 119 tons of shale; and the imported coal had to bear an increased duty of 2s. per ton. The quantity of gas manufactured was 27,390,900 cubic feet, or 9988 cubic feet per ton of coal carbonized; its illuminating power averaging 18·56 candles. The adoption of the report was moved by the Chairman (the Hon. W. Hart), who gave a few interesting comparative figures. He stated that in December, 1892, there were 2852 meters in use, whereas in June of the same year there were only 2802; thus showing an increase of 50. The gas supplied for the quarter ending September, 1891, was 16,128,000 cubic feet, while for the same quarter of 1892 it was only 15,140,700 cubic feet; showing a decrease of 987,300 cubic feet. In the December quarter of 1891, the quantity consumed was 11,206,700 cubic feet, as against 9,427,500 cubic feet in the same quarter of 1892; showing the heavy drop of 1,779,200 cubic feet, or 2,766,500 cubic feet for the half year. The revenue for the September quarter of 1891 amounted to £6135, compared with £5495 for that quarter in 1892; while the December quarter of 1891 showed £4374, as compared with £3592 for the corresponding three months of last year. He was glad to say the coal carbonized turned out very well; and during the past year several improvements had been made on the works. In the remarks following the Chairman's speech, it was stated by the Manager and Secretary (Mr. A. Green) that the quantity of gas consumed in connection with the recent Tasmanian Exhibition was 2½ million cubic feet. This, however, could not be considered in connection with the report then presented. The motion was carried.

The report of the Rockhampton (Queensland) Gas and Coke Company, for the six months ending Dec. 31, last is a document of unusual interest, inasmuch as the Company have an electric light undertaking, which was started, the Directors state, with the view of protecting the Company, and retaining the power conferred upon them by Act of Parliament. Owing to the want of additional capital, the work of completing the private installations had to be suspended; and the electric light station has consequently been placed under the great

disadvantage of running to supply only twelve consumers. No time will be lost in finishing the various business places which are waiting for the light. As they become gradually wired up, and the full capacity of the machinery is utilized, so will the revenue be sufficient for the payment of the working expenses and interest; and the Directors feel sanguine of the future maintenance of the usual dividend. No definite arrangement has yet been made with the Municipal Council for the lighting of the streets with arc lamps. The Company submitted a price, which was under consideration at the date of the report. With regard to the gas portion of the undertaking, the Directors state that the consumption is largely increasing, and the profit is consequently very good. This is due, in a great measure, to the extension of mains in North Rockhampton and elsewhere, which has opened up new and prosperous districts. The liberal discounts allowed to the large consumers have also contributed in no small degree to this improvement, as the unsolicited action of the Company in making these concessions has had the effect of creating a freer use of gas. The accounts accompanying the report show that the profit on the gas operations for the half year was £1851, which, with the balance brought forward, makes up £1917. The loss sustained upon the electrical operations was £595, which includes £365 charged for interest upon the capital involved, together with legal expenses, printing, &c. As there are included in this loss many things inseparable from the starting of a new undertaking such as this, the Directors consider that at least a part of this should be borne by the reserve fund; and they have therefore decided to appropriate £250 of this fund towards the payment of the half-year's dividend—at the same time charging the whole loss to the profit and loss account for the past half year. Since the last half-yearly meeting, a special resolution has been unanimously carried, sanctioning the creation of additional capital by the issue of 6000 £5 shares. Of this number 3000 are issued at a premium of 30s. per share, which will give the Company a direct profit of £4500. The Directors recommend the payment of a dividend at the rate of 10 per cent. per annum, amounting to £1499. Contracts have, they state, been entered into at such advantageous rate to the Company, that a considerable saving will be effected during the year. A large and remunerative extension of gas-mains will probably be made during the current six months.

The Directors of the Wellington (N.Z.) Gas Company present a satisfactory report on their operations in the past twelve months; there having been a very marked increase in the consumption of gas, consequent upon the reduction made in the charge for gas at the commencement of the year. This increase has necessitated the enlargement of the purifying plant. The mains were extended, and 143 new services fixed, during the year. The amount received for gas was £27,499; the total receipts, with the amount brought forward (£2250), being £32,220. The expenditure for coals, wages, &c., was £13,612; the total expenditure, including interest and interim dividend, and the amounts written off plant, &c., being £25,337. The balance carried to the profit and loss account was £6883, out of which a final dividend of 6 per cent. has been paid; making, with the interim dividend, 12 per cent. for the year. The plant has received the careful attention of the Engineer and Manager (Mr. H. P. Higginson, M.Inst.C.E.).

SAN PAULO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at Winchester House, Old Broad Street, E.C.—Mr. F. DELMAR, F.S.A., in the chair.

The MANAGING-DIRECTOR (Mr. J. Heath) read the notice convening the meeting; and the report and accounts, which were referred to in the JOURNAL for the 18th ult., were taken as read.

The CHAIRMAN, in moving the adoption of the report and the statement of accounts, said the shareholders would see that their affairs were much more favourable than when they last met, as the Directors were able to recommend a dividend at the rate of 5 per cent. per annum. They were desirous of paying more; but they must, under absolute necessity, strengthen their reserve and working capital. In giving a *resumé* of the work done during the past three years, he stated that the Company was started in 1870, with a capital of £70,000, to erect 500 lamps in San Paulo and to supply 20,000 inhabitants with gas. In December, 1890, on a capital of £150,000, they were lighting 1488 public lamps and 3300 private houses. In December, 1891, they were lighting 1670 public lamps and 4230 houses, on a capital of £200,000; and last December, 1713 public lamps were being supplied and 4208 houses, on the present capital of £250,000. As would be seen by the balance-sheet, it was necessary that a large stock of coal, mains, meters, and various other materials should be kept on the works and in transit, ready for the many demands made upon the Company for extensions. Further extension of the public lighting had been contemplated by the authorities, and there were many hundreds of householders asking to be supplied with gas; but, under existing conditions at the Port of Santos, the Directors were, for the present, unable to forward sufficient carbonizing material to San Paulo to meet those demands. However, he was pleased to state that they had plant ready to be fixed when circumstances permitted, which rested entirely with the Brazilian authorities, and over which the Directors had no control; and this fact he particularly wished the shareholders to understand. The works and plant were in perfect order and repair; and one of the Directors (Mr. D. M. Fox), who was now at San Paulo, would make a personal inspection, and give them the result on his return. During these unsettled times, it required all the experience of the Board to do as well as they were doing, particularly in the shipping department, in which there was unceasing confusion and tedious delay. This made it difficult to meet with a captain who would now go to Santos Harbour; and such was the cost to the Company in demurrage, that a cargo of coal worth £1000 was sometimes increased to double this amount before it reached the gas-works. Besides this, they were liable to all sorts of disputes and law-suits; for practically, whatever the clauses in the charter-party to secure owners against loss, they were without remedy here. He hoped that this combatting against such difficulties would not last much longer, as they were assured that brighter prospects were approaching, in the fact that the Provincial Assembly, acting in conjunction with the principal merchants and bankers, were earnestly and zealously exercising their influence to restore the customary prosperity of the country at large. He ought to explain, with regard to the project which they brought before the shareholders last year, for securing a landing-place on which to store their coal in readiness to take their turn on the rail—turns that were frequent compared with turns for landing cargoes from the water—that they lost the opportunity of acquiring the land, as the vendor was impatient, and sold it to another applicant, when he heard that the meeting, in October last, at which the matter was brought before the shareholders was deferred for a fortnight, It would have saved the Company heavy demurrage, and would only have cost them the interest on the purchase-money; and when they no longer required the land, they could have disposed of it. At the meeting at which this matter was discussed, a shareholder observed that the land "would be useless to the Company as the rail was also blocked." But the turns on the rail were frequent, compared with the landing-pier; and their all-important object was to be prepared to take their turn on the rail with coal already landed. However, if another opportunity presented itself of obtaining such a landing and storing wharf, the Directors would bring it to the notice of the shareholders. There was one other circumstance to which he wished to refer. Some of the shareholders had expressed to him their alarm as to a statement made by one of their number at the last meeting, on the authority (so he said) of a stock-broker, to the effect that the present disappointing position of the Company was in consequence of the incapacity of the Directors, who were unfit to perform the duties incumbent upon them. He (the Chairman) had been asked to allude to this matter and explain it. The only explanation he need make was a reference to the 22 years' services of the Board, during which time they had shown most prosperous results; and the capacity which they had keenly exercised during the present troubles, he hoped, would allay their alarm with regard to the value of their investment in the Company.

Dr. E. BATT seconded the motion.

In answer to inquiries, it was stated that the consumption of coal was about 10,000 tons a year, which cost the Company £15,000 in demurrage, or 30s. per ton. The block had been going on now for about two years. There was not only the direct loss, but the Company were in a position to supply more gas if they only had the raw material; so that the loss was almost incalculable. Notwithstanding that the price of gas had been raised, the consumption was maintained, though it did not increase much.

Mr. FOWLER congratulated the shareholders on obtaining a dividend at the rate of 5 per cent. He was somewhat amazed at hearing the remarks made by the Chairman towards the close of his speech; it would have been better if he had "let bygones be bygones." He was the shareholder who made the statement to which the Chairman referred. He had previously been dwelling under the impression that their 10 per cent. dividend was a perpetual one; and when he found there was to be no dividend at all, he thought the matter should be investigated. He found the Directors had increased the capital from £100,000 to £250,000; and yet no calculations had been made by them as to what the cost of the works would be for which they obtained the additional £150,000. Then they also asked the shareholders for an amount of debentures to carry on the works. When he examined the books, there were three Directors who received between them in fees £1000 per annum; and they only held 175 shares. He regretted to find the remarks he made had been realized by the subsequent events. The stock-broker to whom he referred was the late Mr. Helps.

The CHAIRMAN said he had consulted other brokers, and asked their opinion regarding the Company; and their reply had been that it was one of the best and safest managed companies in the list.

Mr. C. H. ROBINS observed that there was no question the Directors had a most difficult task on their hands under the existing condition of affairs in Brazil; and he urged upon them not to enter into any enlargements of the works at present. He did not think any gentleman in the room would sympathize with the remarks made by Mr. Fowler; and he trusted they would hear nothing of this kind at future meetings.

The motion was carried unanimously.

A dividend at the rate of 5 per cent. per annum (free of income-tax) having been declared,

On the motion of Mr. F. BARREYMAN, seconded by Mr. S. SPENCER, Dr. Batt was re-elected to his seat at the Board; and subsequently Mr. W. Cash was re-appointed Auditor.

Some conversation followed on a suggestion by Mr. Fowler that the published accounts should be extended so as to include statements of the capital and revenue; but it was generally considered that it would be detrimental to the interests of the Company, and was therefore rejected.

The proceedings then terminated.

The Hull and Yorkshire Water-Softening Syndicate, Limited.—A Company has been registered under this title, with a capital of £6000, in £10 shares, to acquire and work certain patents relating to an improved process of softening water.

Sales of Shares.—At a recent sale by auction at Dorchester, £10 ordinary shares is the *Dorchester Gas Company* were disposed of at £17 17s. 6d. to £18 each—a 10s. share in the Gas-Fitting Company being added to each.——Last Tuesday at Lewes, Mr. Herbert Morris offered for sale by auction £425 original capital stock of the *Lewes Gas Company*, and 13 original £25 shares and a number of new shares in the *Lewes Water Company*. Twenty lots of £20 original gas stock realized from £36 10s. to £37 10s. each; and £25 ditto was sold for £46. The original £25 shares in the Water Company produced from £76 to £77. Nine new £25 shares changed hands at from £50 10s. to £51 10s.; and six £25 shares, on which £20 has been paid, were sold at from £52 to £54. A similar share and a twenty-fifth of a share fetched £56 10s. Ten lots of £20 preference stock in the same Company realized from £27 to £28.——At Chatham, last Friday, 30 £5 shares in the *Rochester, Chatham, and Gillingham Water Company* realized £15 per share at a public auction; and 10 shares in the *Rochester and Chatham Gas Company*, of the value of £3 6s. 8d. each, produced £5 5s. per share.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the Terminus Hotel, Cannon Street—Sir PETER SPOKES in the chair.

The Directors' report and the accounts for the year ending Dec. 31 last (noticed in last week's issue) were taken as read.

The CHAIRMAN said that the report again pointed to a very considerable increase in the demand for water—the rental having advanced by upwards of £3000; and, compared with 1890, by £5000. It was his duty to again explain to the shareholders why, with a revenue of £60,000 a year, it was impossible—at all events, at present—to pay a dividend. He then went through the various items of the revenue account to show how it was that, with an improved revenue, the net balance carried forward was £3575 less; and, in doing so, he intimated that the addition to the outstanding accounts due by the Imperial Government of Russia had been £1087—making the amount owing by them £12,296, which was equal to 2 per cent. upon the preference capital. Among the items of expenditure was the cost of renewing the remaining boilers at the Dneister station, which, with the accessories and Customs duty, cost £3758. Turning to the balance-sheet, he said it would be seen that the liability in respect of temporary loans was £500 less; and outstanding accounts had been reduced by £8000, due especially to the liquidation of the bank overdraft in Odessa. He reminded the shareholders that on Dec. 31, 1891, they had an overdraft of something like £5000, owing to the payment for the unusual stock of coals held in 1891; so that the sum standing to the credit of the revenue account in the balance-sheet had been augmented to £77,000. On the other side of the balance-sheet, it would be seen that the stock of coal had been reduced to £4688; being a difference of something like £6550. The cash in hand and at the bankers in London and Odessa and remittances in transit was some £900 less. The hope that he held out to them at the last meeting in reference to the suspense account, which was created in connection with the defalcations of the late Secretary and his accomplices, had been practically realized; and there was now only the small balance remaining of £33. This, with other amounts which might transpire in connection with this matter, would be dealt with during the present year. Fixed meters, pipes, &c., stood at £1700 more; while the outstanding water-rents and sundry debtors had increased by £6000—making £47,784, of which the £12,296 troop money formed part. There was nothing more to say in connection with the balance-sheet, except that, so long as the Imperial Government refused to pay their just debts, it was not surprising that others should also be slow in paying theirs. As to the future, he wished he was able to say something definite with regard to the negotiations which were taken up last year with something like renewed vigour; and he should also be glad to tell the shareholders that the law-suits in which they were engaged with the Government of Russia and the Municipality of Odessa were on the eve of settlement, because upon these issues depended very much the prospect of a dividend. As he had said, if the Government would pay for the water supplied to the troops, it would be equal to 2 per cent. on the "A" shares; and if the suit with the Municipality concerning the reduction of the price of water for household consumption (which the Directors contended was reduced three years before it should have been) had been settled, this would be equal to a further dividend of 3 per cent. Then, with regard to the fine cases for cloudy or opalescent water, they had every reason to feel that they must be decided in favour of the Company, because expert evidence had proved most conclusively that it was due to circumstances over which they had no control. It was quite possible that, when the Douma which had been recently elected under the new municipal law got fairly into their work, negotiations would be renewed, unless this body should be at all impressed with the policy which so recently prevailed in St. Petersburg, and acquire the works for the Municipality upon terms laid down by the concession. Their Engineer (Mr. J. J. Platts) was very hopeful that much good would result from a congress recently held at Moscow to discuss the subject of water-works undertakings in Russia, with a view to formulating a code of laws and regulations for the better conduct of such bodies, on which subject he read a paper. The matter was referred to a permanent Water-Works Bureau to consider and report upon at the next congress to be held in 1895. He moved the adoption of the report and accounts.

Sir ARTHUR CLAY seconded the motion.

Mr. FRANCIS made a long speech, in which he complained generally of the policy of the Board.

The Directors retiring by rotation (Sir Arthur Clay and Mr. G. May) and the Auditors (Messrs. W. B. Peat and Co.) were re-elected.

A vote of thanks to the Chairman and Directors and to the Acting-Secretary (Mr. E. Allen, who is a member of the Board, and formerly for a number of years the Secretary) concluded the proceedings.

MONTE VIDEO WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at Winchester House, Old Broad Street, E.C.—Mr. F. S. ISAAC in the chair.

The report submitted by the Directors stated that the gross revenue for the past year amounted to £76,327. This was a decrease of £2548, which was entirely due to the reduced amount received from the Government for subvention; the receipts from this source in 1892 being £318, against £3888. The revenue apart from subvention showed an increase of £1021; while the working expenses exhibited a decrease of £2079. The net income amounted last year to £47,218, against £47,687 in 1891. After providing for interest and other charges, and adding £2112 to the fund for the renewal of buildings and plant, there remained an available balance of £21,601. Out of this an interim dividend of 2½ per cent. was paid on Nov. 1 last; and the Directors recommended another dividend of 2½ per cent. (making 5 per cent., tax free, for the year)—carrying forward £1601. No further progress, it was stated, had been made with the negotiations for a new concession; and the Company had continued working on the provisional arrangement made with the authorities in 1891, under which the Company retained all the rights and privileges granted by the original concession, with the exception that the subvention had been reduced to $500 per month.

The Chairman said the shareholders would observe that the net earnings were but little smaller than those of last year, notwithstanding that the sum of £3888 was received in 1891 for subvention, as against £318 in the past year. A favourable feature of their affairs was an increase in the number of services. In December, 1891, they amounted to 9637; and at the end of the past year, to 9946. The net revenue therefore was somewhat disappointing; and could only be accounted for by the great economy displayed by the customers. The average monthly value of the private services, taken over the entire year, was slightly less—viz., $2·76, as against $2·92 in 1890 and 1891. It would be seen that they had reduced the expenditure by some £2000. Turning to the balance-sheet, it would be noticed that the capital expenditure had only slightly increased, as, beyond extensions of the mains attendant on the increase of services, they had had to undertake no new works. The capital expenditure must gradually increase if the business continued to expand as in the past. The time was not yet sufficiently favourable for the Board to contemplate attempting to issue fresh capital; but no opportunity would be lost in making capital expenditure represented by an increased issue of shares or debentures. He could only express the hope that such a time might occur during the present year. The provision which had been made for the depreciation fund, for the renewal of buildings and plant now stood at £14,000, and the special reserve fund amounted to £60,000—these two sums together making 10 per cent. of the subscribed capital, which the Directors considered ample for all emergencies. Some of the shareholders, he believed, thought the Board had been too liberal with reserves, to the detriment of their dividend; but he thought they would not blame the Directors for having been anxious to build up a solid business on very conservative principles. It would be remembered he mentioned last year that they were working under an agreement with the Government, which was to be ratified by Congress. They were then waiting for a favourable opportunity of bringing it before the Chamber; but their Manager reported that up to the present time no such opportunity had presented itself. The extension of the business of late years had been very steady. When the Company was established in 1879, the revenue, exclusive of the subvention bills, was only £36,208; while last year it was £73,717—showing that they had more than doubled the absolute amount of the gross rental. Another agreeable feature in the conduct of their affairs was the substantial decrease in the working expenses during the past ten years. In 1882 they amounted to 48·86 per cent. of the gross takings; whereas, in 1892, they came down to 38·29 per cent. He concluded by moving the adoption of the report and accounts.

Mr. W. A. JONES seconded the motion, which was carried.

The dividend recommended having been declared, the retiring Directors and Auditors were re-elected; and the proceedings then terminated.

The Heckmondwike Local Board and the Gas Company.—In connection with the controversy between the Heckmondwike Local Board and the Gas Company (see *ante*, p. 413), a letter from the latter body was read at the meeting of the Board yesterday week, in reply to a request which had been made for a copy of the annual statement of accounts up to the end of 1892. It stated that it would be impossible to get out accurate accounts for the purpose of complying with this request; but, with a view of meeting the difficulty, the Directors had resolved in future to have the accounts made up twice a year—at June 30 and Dec. 31. The letter added that it was hoped the Company would shortly be in a position to make a further reduction in the price of gas. Mr. T. Redfearn, in the course of some remarks, stated that the Company were still charging about 20 per cent. for gas supplied to the public lamps, the market, &c., in excess of the price in adjoining townships; and that they had a surplus profit of from £1800 to £2000, which they could not divide, and which the public ought to have the benefit of in the shape of a reduction in price. He proposed a resolution authorizing the appointment of an accountant to investigate the Company's accounts, with a view to ascertaining the actual amount of undivided surplus, and to what extent, if any, they were using revenue which ought to come out of capital. He also pointed out that the Company's Act stated that they should provide statements of accounts twice a year, which they had not done. After some further observations, the matter was referred to the General Works Committee.

The Recent Fire at Millbank.—The destructive fire which occurred at a timber yard near Millbank on the morning of the 21st ult., as reported last week (p. 744), afforded an excellent opportunity, owing to the proximity of one of the holders of The Gaslight and Coke Company, for a lot of sensational (and senseless) writing in papers, and scope for the production of attractive lines on their contents bills. Our contemporary the *Globe* came out with an article on "The Moral of the Millbank Fire," which was calculated to increase the groundless alarm felt by the inhabitants of the neighbourhood. The Governor of the Company (Colonel Makins), in a letter to that paper last Friday, pointed out for the Editor's information that coal gas, in itself, is not an explosive agent, and that it is only when mixed with atmospheric air, in a confined space, that it forms an explosive compound. Had a piece of burning timber, or any other weighty article, ruptured the iron sheeting of the holder, the result would not, he said, have been an explosion. The liberated gas would have ignited and burned away in ordinary flame, till the supply became exhausted, and the holder had sunk down to the ground-level. He added that "there is no extra danger in case of a fire in a timber yard adjoining a gasholder (not 'gasometer,' as it is persistently called, as it does not measure but only store the gas), except to the property of the gas company." As far as The Gaslight and Coke Company are concerned, Colonel Makins said they would be very glad to see all timber yards at a considerable distance from their holders; but not on account of any danger of explosion.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners transacted one or two items of business of some interest on Monday. It had reached the ears of the Commissioners, in a sort of roundabout way, that the North British Railway Company are desirous of purchasing the site of the Edinburgh Gas-Works; and though no communication to that effect had been received from the Railway Company, the Commissioners instructed their Clerk to write asking what terms the Company are prepared to offer. Out of this small beginning may arise a large scheme of gas-works reconstruction in Edinburgh and Leith; but it must be some time before that stage is reached. The Commissioners recently had before them the question of whether they should not apply part of their sinking funds in the redemption of annuities; and they approved on Monday of a recommendation by the Finance Committee, dated March 27, that it was not advisable just now to redeem any annuities. Strangely enough, the same Committee reported on April 14, recommending the purchase of £200 of annuities, at a price of £6000. This was adopted; and the Commission drifted into the peculiar position of agreeing to do the thing which five minutes earlier they had resolved not to do. This, the first reduction of the indebtedness of the Commission to the shareholders of the old Companies, makes the sum payable in future £33,800, instead of £34,000 a year. The price paid is 30 years' purchase; and it is not extravagant, though it is a year and a half higher than is payable under the compulsory redemption clause of their Act of 1888, by which, however, the redemption is fixed to begin only after the year 1908. I understand that, on account of the compulsory redemption clause, the annuities of the Commission are not looked upon as a desirable investment for trust funds—a circumstance which makes it easier for the Commissioners to buy in when any come into the market. The Commissioners have coal contracts running for some time yet; and they do not require to purchase largely at this season. The Edinburgh works can go on till July; and for the Leith works, only third and fourth classes are required. Of these, they have agreed to purchase 4300 tons, at an average rate of 10s. 6d. per ton, which is exactly 2s. below the price being paid under the expiring contracts, and represents a reduced cost for the manufacture of gas of 1¼d. per 1000 cubic feet upon the sum estimated in July of last year. The Commissioners approved of a scale of charges for the gas to be supplied for the lighting of common-stairs. This they did without having heard from either of the Corporations whether they have resolved to look after the lighting. Another subject which they had before them was a request by the Corporation of Edinburgh to be furnished with a return showing the amount of revenue derived from gas within the compulsory area under the Electric Lighting Provisional Order. It was decided to give the return, which, however, will be of no use to the Corporation Electric Lighting Committee when they get it. It would have been a more sensible course if the Committee, after ascertaining from householders themselves if they proposed to take the electric light, had then asked the Gas Commissioners the amount of revenue derived from the persons who had agreed to do so. With that in their hands, they would have had a better means of estimating how electric lighting would pay, than they will have by getting a return of the amount paid for gas by (say) 10,000 people, of whom probably not more than 500 will become customers for the new light.

The Edinburgh and Leith Gas Commissioners on Monday did not agree to—in fact, did not consider, the recommendation of their Committee in favour of the adoption of the Peebles process of enriching coal gas by oil; but they directed that the report by Mr. Linton, which was given in last week's JOURNAL, and also a report by Mr. Mitchell, the Engineer of the Edinburgh works, which was presented on March 17, should be circulated among all the Commissioners. In Mr. Mitchell's report, a very elaborate table is given to show the different quantities of 90-candle power oil gas required to raise a 16-candle coal gas from 18 to 30 candle power, and the costs of the different mixtures. The results are given for each half candle from 18 to 30. It is shown that 1000 cubic feet of 16-candle coal gas costs 8·5d.; and that from one gallon of oil, costing 2·132d., the yield of 90-candle gas is 92·64 cubic feet—the cost of 1000 cubic feet of oil gas being 23d. To enrich 16-candle coal gas to 18 candles, requires a percentage of 2·70 of oil gas and 97·30 of coal gas. The cost of the oil gas is 0·621d., and of the coal gas 8·190d.; and the cost of the mixture is 8·811d. per 1000 cubic feet. To enrich to 30 candles, requires a percentage of 18·92 of oil gas and 81·08 of coal gas. The oil gas costs 4·371d., and the coal gas 6·891d.; the cost of the mixture being 11·262d. per 1000 cubic feet. In an appendix, Mr. Mitchell reports, with reference to the Alexander-Paterson process for the manufacture of oil gas, that a mixture of 900 cubic feet of 16-candle coal gas, with 100 cubic feet of oil gas of 150 candles, would test at 29·40 candles; and the mixture would cost 1s. 8¼d. per 1000 cubic feet. Mr. Mitchell considers that the Peebles system is much cleaner and simpler than the Alexander-Paterson system; and that the principle on which the Peebles process is based is also more correct. The Commissioners have now two very valuable reports upon oil enrichment before them; and they should be able to arrive at a right conclusion on the subject. Meanwhile, Mr. Mitchell's assistants are preparing plans for the plant which it is proposed to put down in the Edinburgh works.

The Works and Finance Committee of the Dundee Gas Commission have resolved to recommend the purchase of 48,000 tons of coal, for the year which begins with May, at an average rate of 12s. 3d. per ton. The price paid last year was 16s. The members of the Committee recognize the likelihood there is of a large surplus in 1894; and while they favour a reduction in the price of gas from 3s. 9d. to 3s. 6d. per 1000 feet, there is a feeling among them that too great a reduction should not be made, because it is desirable to write down the capital account as much as possible.

Mr. R. B. H. Thomson, son of Mr. J. Thomson, the Manager of the Inverness Corporation Gas-Works, has been appointed Manager of the Broughty Ferry Corporation Gas-Works, in succession to Mr. Myers, who has resigned. Mr. Thomson, who is about 30 years of age, is a native of Edinburgh, where his father was in charge of the Tanfield station of the Edinburgh Gas Company for many years previous to his appointment as Manager to the Inverness Corporation in 1876. His training has been that of a mechanical engineer; and his apprenticeship was served in the engineering shops of the Highland Railway Company, at Inverness, which he left after serving his time, in order to assist his father in the management of the gas-works. This he has practically been doing since he was 16, as from that time he has made all drawings, specifications, &c., required for renewals and extensions of the works at Inverness. He has done the same for those required by neighbouring towns, of which he had also the supervision in the erection and carrying out. He holds the certificates in Science and Art required by the City and Guilds of London Institute, and has two of that Institute's full technological certificates in their examinations in gas manufacture.

Mr. J. Macpherson, assistant in the Kirkcaldy Gas-Works, has been appointed Manager of the Cupar Gas-Works, *vice* Mr. Gemlow, who has resigned.

It seems that in Tain, where the Police Commissioners about two years ago took over the undertaking of the local Gas Company, and have had to very largely reconstruct the works, reflections had been made by somebody upon the capacity of Mr. Waddell, the Gas Manager. The work being now completed, the Gas Commissioners have adopted a minute expressing their appreciation of Mr. Waddell's ability, industry, and attention; and they also voted him a gratuity.

Sulphate of ammonia is selling in Glasgow at from £12 5s. to £12 10s. per ton for near delivery, and at £11 10s. for forward delivery. One shipment is reported at £13 per ton, which is the highest price received for a considerable time.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 29.

Sulphate of Ammonia.—The market has been extremely quiet during the week; and the demand has fallen away. This is partly due to the absence of rain checking consumptive requirements; and probably partly also to the rapid decline of nitrate leading buyers to believe that a similar reduction in sulphate values will be inevitable. The depression is aided by speculative movements; and already £11 10s. is reported by the dealers for June-September delivery. May quotations are somewhat irregular—in some instances as low as £11 15s. It is difficult to fix a value for spot parcels; but it is nominally £12 to £12 2s. 6d., although more has been paid during the week. Nitrate on spot is 10s. 3d.; but for steamer arrival early May, 9s. 9d. is quoted.

LONDON, *April* 29.

Tar Products.—It has been several years since benzols changed hands at the prices realized during the past week. Important sales of 90's and 50's have been made as low as 1s. 5d. and 1s. 4d. respectively. It is most difficult to prognosticate what will happen with benzol, as it would be more profitable for gas makers to increase the illuminating power of their gas by its use. Should this occur, and the apparent surplus which is now existing be removed, better values would at once obtain. Since the settlement of the cotton strike, there is undoubtedly a better demand for aniline oil and salt, which is sure sooner or later to reflect itself in the value of benzol. Pitch is reported weak; but most makers are well sold. Fuel makers are short of material; and if pitch holders continue firm, there is no reason why prices should go down. There is a good deal better outlet for creosote oil; but owing to the large production in Scotland, the price is extremely low. Tar acids are moving off at old rates; and there is no falling off in the demand. Anthracene is firmly held; and little or none is offering. To-day's prices are: Tar, 12s. 6d. Pitch, 24s. to 25s. 6d. Benzols, 90's, 1s. 5½d.; 50's, 1s. 4½d. Solvent naphtha, 1s. 1½d. Toluol, 1s. 4½d. Crude benzol naphtha, 30 per cent., 7d. Creosote, 3¾d. Creosote salts, 17s. Carbolic acid, 60's, 2s. 4d.; 75's, 2s. 10½d.; crystals, 7½d. Cresol, 1s. 10d. Anthracene, nominal, 30 per cent., "A," 1s. 1d.; "B," 9d.

Sulphate of Ammonia.—A serious change has come over the market. Buyers appear to have temporarily entirely withdrawn themselves. To-day's nominal value does not exceed £12, less 3½ per cent.; while dealers offer as low as 10s. per ton less than this price. The remarkable fall in nitrate appears to be the cause of the collapse in the price of sulphate; but it is admitted all round that there are no stocks of sulphate anywhere, and that important sold contracts will have to be covered between now and the end of June. Gas liquor is quoted at 8s. to 9s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Prices for all descriptions of round coal tend steadily downwards; and although very few collieries are working more than three to four days per week, even this restricted output is in excess of requirements, and considerable stocks are accumulating. Except for small quantities, best Wigan Arley scarcely averages more than 11s. to 11s. 6d.; Pemberton four-feet and second qualities of Arley, 9s. 6d. to 10s.; and common house-fire coals, 7s. 6d. to 8s. With regard to the lower qualities of steam and forge coal—the demand for which shows no improvement—prices are so much a matter of special arrangement where anything like quantities are concerned, that definite quotations are practically of no value. Generally speaking, ordinary steam and forge coals could be bought at the pit mouth at from 6s. to 6s. 6d. per ton upwards; whilst for shipment, sellers are taking from 7s. 6d. to 8s. per ton, delivered at the Garston Docks, or the High Level, Liverpool. As an indication of what will probably be the course of prices when contracts come to be placed for gas coal and locomotive fuel during the ensuing season, it may be mentioned that one of the principal railway companies have been making small preliminary purchases of locomotive fuel, with a view of testing prices; and it is reported that they have been enabled to buy at about 6s. 9d. per ton at the pit mouth—which represents about 9d. under last year's rates. The present very limited production of engine fuel is finding

a ready sale, and some of the collieries have much difficulty in meeting the requirements of their customers. But considerable stocks are still held at many of the pits; and although prices are decidedly hardening, any material advance upon late full rates is not at all readily obtainable. At the pit mouth, burgy may be quoted at about 6s. 6d.; best slack, from 5s. up to 5s. 6d. for special sorts; and lower qualities average 3s. 9d. to 4s. 3d. per ton.

Northern Coal Trade.—There has been an increased demand for certain kinds of coal of late, as is frequently the case prior to the opening of the season for exports to the Baltic ports; and the prices of one or two kinds of coal have sharply advanced. Best Northumbrian steam coal has risen to 8s. 9d.; second qualities are from 8s. to 8s. 3d.; while small steam coal is firm at from 3s. 3d. to 3s. 6d. per ton f.o.b. Most of the collieries are now working full time. In gas coal, there is some variation in the prices; but a fuller demand for export is in part a counterbalance for the falling off in the local consumption. Generally, the price asked is from 6s. to 6s. 6d. per ton f.o.b.; though in the cases of two of the Tyneside collieries higher prices are wanted. On the other hand, there has been some comment on the report that a contract for gas coal has been entered into for delivery far ahead, for an Italian Company, at a price which is below that now current, when allowance is made for freight, dues, &c. There is no alteration of moment in the coke trade. Of gas coke, some of the inland gas companies have rather heavy stocks. But it is probable that the exports will now be increased; and with a diminished production, there should be a fall in the stocks soon. There is no change in the prices of gas coke this week.

Scotch Coal Trade.—There is still very little encouragement to coal merchants in the trade in Scotland. Ell is in better demand for Riga and Cronstadt, which are now free of ice; but the demand has not been sufficient to affect the price. Dross is scarce, and is selling well. Other varieties are unchanged. The prices quoted are: Main, 5s. 9d.; ell, 6s. 9d. to 7s.; splint, 6s. 3d.; and steam, 8s. per ton—all f.o.b. Glasgow. The shipments during the past week amounted to 127,390 tons—a decrease of 22,801 tons upon the preceding six days, and of 18,007 tons as compared with the corresponding week of last year. For the year to date, the total shipments have amounted to 1,790,212 tons—a decrease as compared with the same period of last year of 165,483 tons.

Inadequate Water Supply in the Preston District.—After considerable delay, the Preston Rural Sanitary Authority have approved of a scheme for supplying the inhabitants south of the Ribble with pure water; the initial cost being put down at £5000. The people in the district have for a long time been dependent for their water upon pits, generally contaminated with surface drainage. The prolonged drought has aggravated matters; and it is said there is not a drop of water in the district, except pit water.

The Water Supply of Milton and Sittingbourne.—The proposa to accept the offer of £2000 made by the Sittingbourne Local Board for Milton to withdraw from the joint water agreement, and establish water-works of their own, has engaged the consideration of the Milton Commissioners for some months past, as already mentioned in the JOURNAL. The climax was reached last Friday, when it was decided that, although separate water-works might be started at a slight profit, the risk was too great, and the contingencies too hazardous, to be undertaken by the Board. Milton will therefore join Sittingbourne in undertaking a joint water scheme, embracing an extensive enlargement of the works at the latter place.

The Proposed Purchase of the Runcorn Water-Works.—A meeting of the ratepayers of Runcorn was held a short time since to consider the proposed purchase of the Runcorn, Weston, and Hilton Water-Works by the Local Commissioners. The Secretary (Mr. E. Marshall) read a report from Mr. J. L. Tunstall, chartered accountant of Warrington, who had made an examination of the Company's accounts for last year, which stated that, in view of the better results shown by the concern, the purchase of the undertaking would appear to be highly desirable; and as regarded the present works, provided the sinking funds were arranged at the rate of 3½ per cent. per annum, there would, should the profits remain stationary, be not only no charge upon the rates, but an immediate annual surplus of £170 or thereabouts. The Chairman (Mr. F. Wiswall) announced that the Committee of the Commissioners had unanimously decided to recommend the Board to purchase the undertaking on terms agreed upon with the Company—viz., £67,500. A resolution in favour of the purchase of the works was adopted by a large majority. The Commissioners have agreed to the recommendation of the Committee. It is reported that they are also proposing to expend a large sum of money in connecting the town with the Vyrnway main of the Liverpool Corporation.

Exhibitions of Gas Appliances.—A very successful exhibition of gas stoves and appliances was concluded at Portsmouth on the 22nd ult. by Messrs. Richmond and Co., Limited, of Warrington and London. It was promoted under the auspices of the Portsea Island Gas Company, and was well attended. Lectures on cooking by gas, and also an address by Mr. E. W. T. Richmond, were given to appreciative audiences. A similar exhibition, with cookery lectures, extending over a fortnight, has just been held by them in Dublin, in conjunction with the Alliance Gas Company.——An attractive exhibition of gas appliances was held in the Masonic Hall, Douglas (Isle of Man), from the 18th to the 22nd ult., by Messrs. R. and A. Main, of Glasgow and London. It was opened with an address by the firm's representative (Mr. Maclay); the cookery lectures and demonstrations being entrusted to Miss Burden. The firm also exhibited last week in the Burgh Hall, Lennoxtown; Miss Hunter and Mr. A. P. Main giving lectures. A feature of the exhibition was a gas-cooked dinner.——Successful exhibitions were held at Malvern Link and New Southgate last week, by the Davis Gas-Stove Company, Limited.——During the past week an exhibition was held at the Town Hall, Brighouse, and was fairly well attended. Among the manufacturers who were represented were Messrs. Wilson and Sons, Messrs. Stott and Co., and Messrs. Bray and Co. A series of demonstrations were given by Miss Annie Smith, of the Yorkshire School of Cookery.

Tarapaca Water-Works Company.—The fifth annual general meeting of this Company was held on Monday, the 10th ult., at Winchester House, Old Broad Street. Mr. R. Harvey presided; and, in moving the adoption of the report and accounts, which had been briefly noticed in the JOURNAL, said the gross receipts now were £5300 per month, or upwards of £60,000 per annum, which would give ample margin for the 10 per cent. dividend, and enable them to lay by £10,000 a year so as to pay off a loan of £50,000. The motion was agreed to.

Reduction in the Charge for Water at Chatham.—The Directors of the Chatham Water Company have decided to reduce the charge for water used for general and domestic purposes by 12½ per cent.; and where the supply is measured, by 5 per cent. This reduction will mean a concession of £2000 per annum to the ratepayers of the three towns supplied by the Company; and it is considered in Chatham and Rochester that it will be the death-blow to any chance that may have existed of the proposal to municipalize the undertaking being carried into effect.

South Shields and the Electric Light.—Nearly two years ago, the Corporation of South Shields obtained a Provisional Order to enable them to carry out an electric lighting scheme in the borough; but up till quite recently they have not made any move towards exercising the powers thereby conferred. They are now doing so, however; and they have before them a report by Mr. E. J. Jennings. According to him, plant for the supply of 6000 lamps would be sufficient for lighting the streets in the compulsory area, including the Corporation lighting; but provision would have to be made for a probable extension beyond the limits, which would necessitate 2000 lights more. The cost of the whole undertaking is reckoned at £14,000; and it is thought that, if the Corporation charge 5¾d. per unit, there will be sufficient return to pay interest and current expenses. Supposing the 6000 lights installed, the estimated gross profit on a year's working is put at £1094. The Committee who have the matter in hand have visited Newcastle, with the object of inspecting the system in use there; but, in order to carry out any scheme, an extension of time will have to be applied for.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 770.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	"	7½	Do. 7 p. c	10	12—13	..	5 15 5
300,000	100	3 Jan.	5	Australian (Sydney) 5 % Deb.	100	104—106	..	4 14 2
100,000	20	30 Nov.	8	Bahia, Limited	20	11—12	..	13 6 8
200,000	5	16 Nov.	6½†	Bombay, Limited	5	5⅜—6½	..	5 4 0
40,000	5	"	6½†	Do. New	4	4—4½	..	5 15 6
380,000	Stck.	24 Feb.	11½	Brentford Consolidated . .	100	216—220	+1	5 4 7
180,000	"		8½	Do. New	100	168—173	..	4 18 3
220,000	20	15 Mar.	11½	Brighton & Hove Original .	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol.	100	104—107	..	4 13 5
320,000	20	13 Apl.	11½	British.	20	42—14	..	5 4 7
50,000	10	15 Mar.	11½	Bromley, Ordinary 10 p. c. .	10	19—20	..	5 15 0
51,510	10	"	8½	Do. 7 p. c. .	10	14½—15½	..	5 9 8
328,750	10	"	—	Buenos Ayres (New) Limited	10	5½—6½	..	—
200,000	100	3 Jan.	6	Do. 6 p. c. Deb. .	100	98—100	..	5 0 0
150,000	20	24 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock . .	100	241–246*	..	5 1 7
165,000	"	"	9½	Do. New do. . . .	100	182–187*	..	5 1 7
160,762	"	15 Dec.	4½	Do. 4½ p. c. Deb. do.	100	127—132	..	3 8 2
800,000	Stck.	15 Dec.	13	Continental Union, Limited .	100	234—239	..	5 8 9
200,000	"	"	10	Do. 7 p. c. Pref .	100	190—195	..	5 2 7
75,000	Stck.	15 Mar.	10	Crystal Palace District . .	100	187—192	..	5 4 2
486,090	10	27 Jan.	10	European, Limited	10	21½—22½	..	4 8 11
354,060	10	"	10	Do. Partly paid	7½	15—16⅞	+⅛	1 13 9
5,596,560	Stck.	10 Feb.	12	Gaslight & Coke, A, Ordinary	100	220—225	..	5 6 8
100,000	"	"	4	Do. B, 4 p. c. max.	100	95—99	..	4 0 10
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	+1	3 14 7
30,000	"	"	5	Do. F, 5 p. c. Prf. .	100	118—123	+3	4 1 3
60,000	"	"	7½	Do. G, 7½ p. c. do. .	100	168—173	+3	4 6 8
1,300,000	"	"	7	Do. H, 7 p. c. max .	100	168—172	+1	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Prf. .	100	260—265	..	3 15 6
476,000	"	"	6	Do. K, 6 p. c. Prf. .	100	156—160	+1	3 15 0
1,061,150	"	15 Dec.	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
894,850	"	"	4½	Do. 4½ p. c. do.	100	130—134	..	3 7 2
908,000	"	"	6	Do. 6 p. c. do	100	169—173	..	3 9 4
3,800,000	Stck.	16 Nov.	12	Imperial Continental . . .	100	228—231	..	5 3 10
75,000	5	30 Nov.	6	Malta & Mediterranean, Ltd.	5	4½—5	..	5 0 0
560,000	100	4 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	104—106	–1	4 14 2
541,920	20	16 Nov.	5	Monte Video, Limited. . .	20	13½—14½	..	6 18 0
150,000	5	30 Nov.	10	Oriental, Limited	5	7⅞—8¼	..	5 1 2
60,000	5	29 Mar.	7	Ottoman, Limited	5	4—4½	..	7 7 4
166,870	10	—	2	Pará Limited.	10	2—2½	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.. . . .	100	103—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	28 Apl.	5	San Paulo, Limited	10	8½—9¾*	..	5 5 3
500,000	Stck.	24 Feb.	15½	South Metropolitan, A Stock	100	292—297	+2	5 4 4
1,350,000	"	"	12	Do. B do. .	100	242—247	+2	4 17 2
830,000	"	"	13	Do. C do. .	100	245—250	..	5 4 0
750,000	"	13 Jan.	5	Do. 5 p. c. Deb. Stk. .	100	148—152	..	3 5 9
60,000	Stck.	15 Mar.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
744,897	Stck.	30 Dec.	10	Chelsea, Ordinary	100	264—268	+2	3 14 7
1,720,252	Stck.	29 Mar.	8	East London, Ordinary . .	100	211—215	+1	3 14 6
544,440	"	30 Dec.	4½	Do. 4½ p. c. Deb. Stk. .	100	142—145	..	3 2 1
700,000	50	15 Dec.	8½	Grand Junction	50	111—114	+1	3 14 7
708,000	Stck.	10 Feb.	11	Kent	100	278—283	..	3 17 9
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max. . .	100	242—247	+1	3 16 11
406,200	100	"	7½	Do. 7½ p. c. max. . .	100	197—202	..	3 14 6
285,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk..	100	129—132	..	3 0 7
500,000	100	10 Feb.	12½	New River, New Shares . .	100	327—332	+1	3 13 0
1,000,000	Stck.	27 Jan.	4	Do. 4 p. c. Deb. Stk .	100	133—137	..	2 18 5
902,300	Stck.	15 Dec.	6½	S'thwk & V'xhall, 10p. c. max.	100	164—169	+1	3 16 11
126,500	100	"	6½	Do. D 7½ p. c. do.	100	145—150	..	4 6 8
1,155,066	Stck.	15 Dec.	10	West Middlesex.	100	260—265	..	3 15 6

*Ex Div.

† Next dividend will be at this rate.

The Assessment of the Liverpool Corporation Water-Works.—At the meeting of the Liverpool Corporation Water Committee last week, the Deputy Town Clerk reported that, as the result of an interview with the Assessment Committee of the Llanfyllin Union, they had intimated that they were prepared to allow the assessment of the water-works for the several parishes in their Union, which was the subject of an appeal, to remain at £5084 15s. It was sought by the Union to increase the assessment to £20,339.

Rotherham and the Water Supply of Greasbro'.—Last Tuesday Mr. F. H. Tulloch, one of the Local Government Board Inspectors, held an inquiry at Greasbro' relative to an application by the Local Board for power to borrow £1200, for the purpose of laying pipes to connect the district with the water-mains of the Rotherham Corporation. An agreement has been entered into between the two bodies, by which the Corporation have contracted to supply the Board, for a period of 30 years, with water, at the rate of 9d. per 1000 gallons.

South African Lighting Company.—The accounts of this Company for the past year show that the balance of profit and loss is £6035. From this the Directors recommend the transfer to the reserve account of £1250, raising it to £3000; the transfer to a plant depreciation account of £500; the payment of the usual dividend of 8 per cent. for the year, less the interim dividend of 2½ per cent. paid in October last; and after giving the bonus to the officials at Port Elizabeth, amounting to £405, the carrying forward to the next account of the balance remaining—viz., £1480.

Ramsgate Water Supply.—At the meeting of the Gas and Water Committee of the Ramsgate Corporation on the 27th ult., the Engineer (Mr. W. A. Valon) reported that he had succeeded, after much time expended in negotiations, in arranging with the South-Eastern Railway Company, through Mr. Brady, the Engineer, and Sir Myles Fenton, for permission to extend the water adits along their line, which runs directly across the natural water-way. While being fair to the Company, this is of the utmost advantage to Ramsgate. It allows a further extension of adits to be made, as required, of a mile and a half in extent; and there seems little doubt that, by the knowledge and foresight displayed by the Engineer in making this arrangement, it has secured an ample service of water for the town and district for a long time to come. For any town, especially one situated as Ramsgate is, the purity and abundance of the water supply must be an important, if not its chief, recommendation as a health resort.

A Further Concession to the Gas Consumers of West Kent.—A short time ago, the Directors of the West Kent Gas Company announced their intention of making a reduction of 6d. per 1000 cubic feet for all gas used for heating and motive power. We now learn from the Secretary (Mr. R. P. Keys) that they have initiated a bold and, we believe, as far as this country is concerned, unique movement, with the view of further stimulating consumption. It is based on the co-operative principle; the Company seeking to secure a continuance of their profits out of the maximum price charged, and giving the consumers the advantage of a reduction on all gas, beyond 100 cubic feet, burnt in excess of the quantity for the corresponding quarter. The new arrangement came into operation on Lady Day. Assuming that at the close of the current quarter a consumer's gas bill is 3000 cubic feet higher than it was for the three months ending at Midsummer, 1892, the extra gas will be charged at the reduced rate of 3s. 4d., instead of 4s. 6d. per 1000 cubic feet. The reduction will apply to all the additional gas, for whatever purpose it may have been consumed. This concession on the part of the Company should be attended by largely-increased sales.

Proposed Water Scheme for Glossop.—A special meeting of the Glossop Town Council was held on Wednesday last, to consider the advisability of providing an additional supply of water for the borough. The report of the Engineer who had been consulted (Mr. E. Muir, of Manchester) stated that the present maximum consumption of water was about 380,000 gallons daily; the population supplied being about 15,000—giving an average of 25 gallons per day per head of the population. In dry seasons this could not be maintained; and an additional supply was necessary. He suggested that the Council should acquire the remaining half of the water flowing down Blackshaw Clough, and construct a compensation reservoir for millowners in the valley of the Shelf Brook, above the Mossy Lee Bridge. He estimated that the cost of the undertaking would be about £8000. During the course of a long and exciting discussion, Captain Partington expressed his approval of the scheme; but if the Council were not prepared to go to the full extent suggested, he was willing that the project should be modified. This was opposed by the Mayor and other members; it being pointed out that there was no necessity for a further supply at the present time. But should it be required, it was thought desirable and more economical that the water should be obtained from the Manchester Corporation. It was ultimately agreed to postpone the discussion till the July meeting of the Council.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

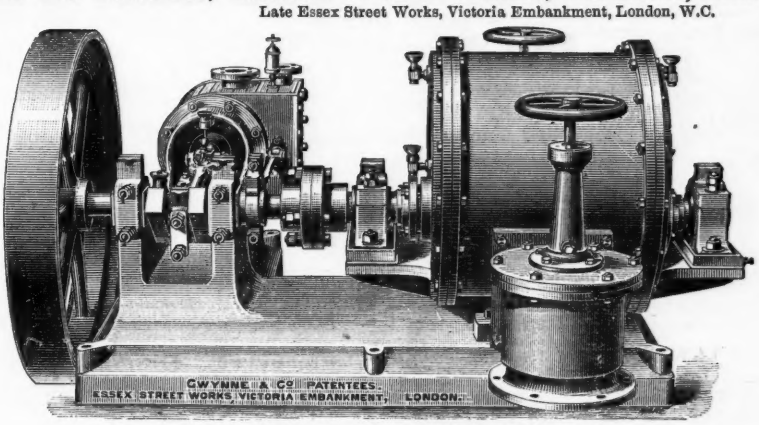
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR and Tar wanted.
BROTHERTON AND Co., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 90, St. Andrew Square, Edinburgh, } Scotland.
Newton Grange, near Dalkeith,

PORTER & CO., Gowts Bridge Works,
LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "Porter, Lincoln."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical
Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

A DUTCH Gas Engineer (28), speaking
English, German, and French, desires an ENGAGEMENT. He has had large experience in Gas-Works on the Continent, and in the Manufacture of Oxygen.
Apply, by letter, to No. 2229, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CHEMIST and Photometrist, with a
number of years' experience of Gas Manufacture, requires SITUATION. Accustomed to Testing and Analysis of Illuminating and Furnace Gases, Coals, Materials used in Purification, Residuals, &c., and other Chemical work. Good character.
Apply, by letter, to No. 2238, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, by a practical Man, a
Situation as GAS-FITTER, MAIN and SERVICE LAYER. Would take Management of Small Gas-Works. Has had five years' experience in Electric Lighting. Can do wiring, and all repairs necessary. No objection to going abroad. Good reference.
Address No. 2227, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A WELL-CONDUCTED Youth, about
16 years of age, having just left School, being anxious to obtain employment, would be glad to hear of anything in which his Services could be made available. Is a good French Scholar, both as to speaking and writing, having two Preceptor's Certificates to that effect and a Cambridge Local (Junior), a good Arithmetician, and, age considered, fairly well up in Shorthand and Geometrical Drawing.
References to W. Livesey, 76, Palace Chambers, Westminster.

WANTED, a good steady Man as
STOKER. One used to Engine and Exhauster preferred.
Apply to the Manager, Gas-Works, Chertsey.

DRAUGHTSMAN.

WANTED, a good Draughtsman, who
has had experience in Gearing, Elevators, Conveyors, and Hoppers.
Address Mr. Gilbert Little, 3 and 4, Lime Street Square, London, E.C.

CARDIFF GASLIGHT AND COKE COMPANY.

WANTED, a Works Manager at the
Company's Grangetown Station. Salary commencing at £200 per annum, with House, Coal, Gas, &c., free.
Applications, stating age and experience, accompanied by *copies* of not more than three recent Testimonials, to be sent in by Thursday, May 4, 1893, to Mr. H. Morley, the Engineer, and endorsed "Works Manager."

By order,
George Clarry,
Secretary.

Cardiff, April 12, 1893.

CITY OF MANCHESTER.

APPOINTMENT OF AN INSPECTOR OF GAS-METERS.

THE Justices of the Peace for the City
of Manchester are prepared to receive APPLICATIONS for the office of INSPECTOR OF GAS-METERS for the City.
The person appointed must have a practical acquaintance with Gas and Meters. He will be required to devote his whole time to the duties of the office, and to enter into security to the amount of £300 for the due and faithful performance thereof.
The Salary will be £200 per annum.
Applications for the appointment, accompanied by testimonials as to character and ability, to be sent, post free, to the undersigned, on or before the 6th of May next.

Le Court and Thorp,
Clerks to the City Justices.

City Police Court, Manchester,
April 24, 1893.

WANTED, Gas Liquor.
Address George Dobson, Limited, Cardiff.

J. & H. ROBUS are desirous of Pur-
chasing, for Cash, a really good, second-hand, small EXHAUSTER and ENGINE combined.
State price and particulars to 20, Bucklersbury, London, E.C.

WANTED, 100,000 to 200,000 gallons
of CREOSOTE, for delivery over the next Twelve Months. Gravity, 1030 to 1050.
Address, stating lowest price, No. 2226, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—Purifier Valve, four-way
(6-inch), by Cockey, Frome, in good condition.
METERS, second-hand, two and three light; surplus stock.
Apply to the Secretary, Gas Company, Solihull, Warwickshire.

FOR SALE—A perfectly new 20,000
cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. Marsh, 41, Corporation Street, Manchester.

FOR SALE, at the Redhill Gas-Works,
Surrey—Four 12 feet square PURIFIERS, 6 feet deep, with Centre-Valve and Traveller, T-iron Bearers, and Wood Grids, complete, price £250.
Applications to the undersigned.

C. Read,
Manager, &c.

FOR SALE, at the Barnsley Gas-Works—
Four 12 feet square PURIFIERS, with Centre-Valve, Connections, &c.
The above are in good condition, and may now be seen at work; only being sold to make room for larger.
For further particulars, apply to

John Hutchinson,
Manager.

ALDERSHOT GAS AND WATER COMPANY.

KIRKHAM'S Scrubber, with 8-inch
Connections, and four 12 feet square PURIFIERS to be Sold.
Offers to be addressed to the Honorary Secretary, at the Offices of the Company, 103, Victoria Road, Aldershot.

TO LIME, CEMENT, AND BRICK BURNERS.

BREEZE FOR SALE.

A GAS Company in South Wales offer
2000 tons of good, clean COKE BREEZE FOR SALE, delivered f.o.b., or on Rail, at 2s. per ton (21 cwt.)
Apply, by letter, to No. 2223, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

THE Southampton Gaslight and Coke
Company have FOR DISPOSAL, and taken apart ready for removal by Rail or Water, the SIDE and BOTTOM PLATES of a Cast-Iron GASHOLDER TANK, about 61 feet diameter by 18 feet deep. Weight about 125 tons. Makers, Westwood and Wright. To be removed at Purchaser's own risk.
May be viewed on application to Mr. S. W. Durkin, Manager, Gas-Works, Southampton.

RUSHDEN AND HIGHAM FERRERS DISTRICT GAS COMPANY, LIMITED.

IN consequence of the Amalgamation of
the Rushden and Higham Ferrers Gas Companies, and the erection of entirely new Works, the Directors of the above Company have the following PLANT FOR SALE:—
One TWO-LIFT GASHOLDER. Outer Lift, 35 ft. by 15 ft.; inner do., 33 ft. 6 in. by 15 ft.
One SINGLE GASHOLDER, 35 ft. by 12 ft.
One TWO-LIFT GASHOLDER, 30 ft. by 20 ft.
SCRUBBER.
PIPE and ANNULAR CONDENSERS.
PURIFIERS.
STATION METERS.
RETORT IRONWORK, HYDRAULIC MAINS.
Various VALVES and CONNECTIONS.
For particulars and permission to view, apply to Jno. T. Lewis, Engineer, Gas-Works, Wellingborough.

TO MANUFACTURING CHEMISTS.

TAR AND AMMONIA WATER.

THE Directors of the Loughborough
Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIA WATER, to be produced at their Works for One Year, from the 30th day of June, 1893.
The estimated quantities will be about 350 tons of Tar, and 900 tons of Ammonia Water. The Tar and Liquor to be delivered into the Contractor's Boats at the Wharf, on the Derby Road, Loughborough.
The strength of the Liquor to be tested by Twaddel's Hydrometer (temperature 60°); and the tender to state the price per ton of 4° up to 8°.
The Boats for the removal of the Tar and Liquor to be sent at such times as may be required.
Payments, 10th of following month.
Further information may be obtained on application to the undersigned, to whom Tenders, in accordance with this advertisement, must be sent not later than the 8th day of May, 1893.
The Directors do not bind themselves to accept the highest or any tender.

J. B. Ball, C.E.,
Manager.

Loughborough, April 27, 1893.

SADLER AND CO., LIMITED,
Middlesbrough; Ulverston (Barrow); Portsmouth; Carlton; Stockton; 315, St. Vincent Street, Glasgow; 10, Marsden Street, Manchester; and 85, Water Street, New York. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA, SULPHATE, &c.
Head Office: Middlesbrough. Correspondence invited.

MR. J. C. CHAPMAN, Fellow of the
Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, London, W.C.

FOR SALE, the following second-hand
GAS PLANT:—
GASHOLDER, 35 ft. by 14 ft.
GASHOLDER and Cast-Iron TANK, 30 ft. by 17 ft.
Four PURIFIERS, 12 ft. square by 4 ft. 6 in. deep.
Cast-Iron SCRUBBER, 36 ft. high by 10 ft. diameter.
CONDENSERS to pass 500,000 cubic feet per diem.
EXHAUSTER to pass 20,000 cubic feet per hour.
Also various other sizes of above or any Gas Plant.
Inquiries invited.
Apply to Saml. While, 60, Queen Victoria St., E.C.

DENTON AND HAUGHTON LOCAL BOARD.
(Gas Department.)

COAL.

THE Gas Committee invite Tenders for
COAL, the same to be sent in on or before the 10th of May inst.
Specification and Form of Tender may be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester.

By order,
John Richards,
Clerk to the Board.

April 27, 1893.

DENTON AND HAUGHTON LOCAL BOARD.
(Gas Department.)

TAR.

THE Gas Committee invite Tenders for
TAR, the same to be sent in on or before the 10th of May inst.
Particulars may be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester.

By order,
John Richards,
Clerk to the Board.

April 27, 1893.

SULPHATE OF AMMONIA.

OFFERS are invited for about 18 tons
of good grey SULPHATE, in one or more lots.
Price to be free on Rails, Bodryngallt Siding, Ystrad, Taff Vale Railway.
Terms to be stated in tenders, which must be sent to the undersigned.
The highest or any tender not necessarily accepted.

F. J. Baynes,
General Manager.

Ystrad Gas and Water Company,
Pentre, near Pontypridd.

CORPORATION OF NOTTINGHAM.
(Gas Department.)

TENDERS FOR COALS.

THE Gas Committee are desirous to re-
ceive OFFERS for supplies of COALS, COBBLES or NUTS, for the period terminating the 30th of June 1894.
The Large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by, and at the expense of, the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.
The Coals, Cobbles, or Nuts are to be the best of their respective kinds, freshly wrought and well screened (description, size, and inclination of screen to be specified), to be as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the ton) upon the Corporation machines, or upon such other machines as may be mutually agreed upon.
Payments will be made monthly, if and so long as the contract shall be duly fulfilled.
The Corporation do not bind themselves to accept the lowest or any tender.
Further Information, and Forms on which the tenders must be made, may be obtained on application to me, at the General Manager's Office; and the tenders (sealed), specifying the description of Coals, the Seam and the Pits at which they are to be raised, and stating the prices for deliveries at the several places, and in manner and subject to the conditions aforesaid, must be delivered to Samuel George Johnson Esq., Town Clerk, on or before Saturday, the 6th day of May, 1893.

By order,
William Reginald Chester,
Engineer and General Manager.

Corporation Gas Offices, George Street,
Nottingham, April 27, 1893.

TO BUILDERS AND CONTRACTORS.

TENDERS wanted for the erection of GAS-WORKS at Bromyard, in the County of Hereford.

Plans may be seen, and Copies of Specifications obtained from the Secretary, Bromyard Gas, Light, and Power Company, Limited, upon depositing £2, which will be returned upon receipt of a genuine tender.

Tenders to be sent in on or before the 10th inst.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

THE above Company are prepared to receive TENDERS for One, Two, or Three Years for the supply of 3600 tons per annum of the best screened GAS COALS, to be delivered at Woodford (Essex) Station, free of all charges, in quantities of 300 tons per month.

Tenders to be sent to the Offices of the Company, addressed to the Chairman, not later than the 10th of May next.

The lowest or any tender not necessarily accepted.

By order,
E. J. HOLWELL,
Secretary.

Snake's Lane, Woodford, Essex,
April 22, 1893.

THE Gas Committee of the Tyldesley Local Board invite TENDERS for 21 RETORTS, FIRE-BRICKS, and FIRE-CLAY for same, delivered at Tyldesley Station.

Specification and Particulars may be had from the undersigned.

Sealed tenders, endorsed "Retorts," to be delivered not later than Ten a.m. on Thursday, the 11th of May, at these Offices.

The Committee do not bind themselves to accept the lowest or any offer.

By order,
JAS. CRANSHAW,
Gas Manager.

Offices of the Local Board:
36, Elliott Street, Tyldesley,
April 26, 1893.

PORTOBELLO GASLIGHT COMPANY, LIMITED.

TAR AND LIQUOR.

THE Directors are prepared to receive TENDERS for TAR and LIQUOR produced at their Works, from the 1st of June, 1893, till the 31st of May, 1894.

The Purchaser to supply all Casks or other Vessels for its removal.

Delivery at Works, or on Rail at Portobello Station (N.B. Railway), as may be agreed upon.

Strength of Liquor to be 4° Twaddel at 60° Fahr.

Offers, endorsed "Tender for Residuals," to be lodged not later than the 4th of May.

DAVID VASS,
Secretary.

Portobello, April 28, 1893.

ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY.

THE Directors of the Elsecar, Went- worth, and Hoyland Gas Company are prepared to receive TENDERS for Two 8 feet square by 4 ft. 6 in. deep PURIFIERS, with Centre-Valve to work Four Purifiers, three on and one off, 10-inch Connections.

Parties tendering to supply and erect complete with Wrought-Iron Covers, Wood Grids, T-Iron Bearing Bars, and Lifting Gear for Covers; ground space, 20 ft. by 11 ft.

The Gas Company to excavate and put in Foundations for the above.

Further information may be had by applying to the Manager, Gas-Works, Elsecar, near Barnsley.

H. C. OATES.

Elsecar, Barnsley,
April 24, 1893.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of first-class NEWCASTLE GAS COAL in three Annual quantities of 14,000 tons each, delivered free into Carts on the Quay of Ramsgate Harbour. The first 14,000 tons to be delivered, in equal monthly quantities, between the 1st of July, 1893, and the 30th of June, 1894; and the second and third years' supply, in equal monthly quantities, between the 1st of July, 1894, and the 30th of June, 1895, and the 1st of July, 1895, and the 30th of June, 1896.

Separate prices to be named for each annual quantity.

Tenders to be sent in not later than Ten a.m. on Monday, May 15, addressed to the Chairman of the Gas and Water Committee, Hardres Street, Ramsgate, and endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any tender.

Full Particulars and Form of Tender on application to
WILLIAM A. VALON,
Engineer.

WESTGATE AND BIRCHINGTON GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply of first-class NEWCASTLE GAS COAL, in three Annual quantities of 1675 tons each, to be delivered free in Trucks, at the Westgate Railway Station, L. C. & D. Line. The first 1675 tons to be delivered, in equal monthly quantities, between the 1st of July, 1893, and the 30th of June, 1894; and the second and third years' supply, in equal monthly quantities, between the 1st of July, 1894, and the 30th of June, 1895, and the 1st of July, 1895, and the 30th of June, 1896.

Separate prices to be named for each annual quantity.

Tenders to be sent in not later than May 16, addressed to the Chairman of the Westgate and Birchington Gas Company, 3, Prince's Street, Storey's Gate, Westminster, S.W., and endorsed "Coals."

The Directors do not bind themselves to accept the lowest or any tender.

Full Particulars and Form of Tender on application to
WILLIAM A. VALON,
Engineer.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of 9000 tons of COAL (Screened, Nuts, or Cobbles) and 1000 tons of CANNEL.

Specification and Form of Tender may be obtained on application to Mr. W. Whatmough, Gas Manager.

Sealed tenders, marked "Coal," to be sent to me not later than Tuesday, the 16th of May, 1893.

By order,
A. B. PILLING,
Town Clerk.

Municipal Buildings, Heywood,
April 19, 1893.

TENDERS FOR COAL.

THE Scarborough Gas Company invite TENDERS for the supply of about 20,000 tons of best screened GAS COAL or COBBLES per annum for One or Two Years from the 1st day of July next, delivered in N. E. Wagons at Pit, or Gas-Works Siding, Scarborough (20 cwt. per ton), in such monthly quantities as may be required.

Tenders, endorsed "Tender for Coal," to be delivered at the Company's Offices, 32, Westborough, Scarborough, not later than Ten o'clock a.m., on Monday, the 8th day of May next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
WILLIAM J. MOON,
Secretary and Manager.

April 25, 1893.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL AND COKE.

THE Directors are prepared to receive TENDERS for the supply at their Works, situate near the Railway Station, Belper, of 2000 tons, more or less, of GAS COAL (part in the Gas Company's own Waggons); also about 200 tons more or less of CANNEL COAL, to be delivered at such times, and in such quantities, as the Directors or their authorised Servants shall from time to time order.

Sealed tenders, stating price per ton of 21 cwt., and information as to the quality and quantity of Gas the Coal is estimated to produce, also as to where the same is now in use, to be sent to the undersigned, on or before Friday, the 5th of May, 1893.

The Directors do not bind themselves to accept the lowest or any tender, nor to take the whole of the above quantities of Coal or Cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, April 24, 1893.

WALLASEY GAS AND WATER WORKS.

TO COAL MERCHANTS AND OTHERS.

THE Wallasey Local Board are prepared to receive TENDERS for the supply of about 15,000 tons of CANNEL and GAS COAL for their Gas-Works, delivered in Waggons at Duke Street, Birkenhead, separately, for One, Two, or Three Years, from the 30th of June next.

Specifications and any further Information may be obtained on application to the Engineer, at the said Works.

Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be left at my Office, as below, not later than Five o'clock in the Afternoon of Thursday, the 11th day of May, 1893.

The Contractor will be required to enter into a bond with approved sureties for the due performance of the contract, which contract and bond will be prepared at the expense of the Contractor.

The Board do not bind themselves to accept the lowest or any tender.

By order,
W. DANGER,
Clerk to the Board.

Public Offices, Egremont, Cheshire,
April 27, 1893.

IMPORTANT ISSUE OF

FIVE PER CENT. MAXIMUM

GENERAL CAPITAL STOCK

IN THE

BRISTOL GAS COMPANY.

GEO. NICHOLS, SMITH, & ALDER are instructed to sell by PUBLIC AUCTION, at their Sale-Room, 49, Broad Street, Bristol, on Thursday, the 18th day of May, 1893, at 2.30 p.m. precisely, in lots of £100 each,

£25,000

FIVE PER CENT. MAXIMUM

GENERAL CAPITAL STOCK

OF AND IN

THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers.

The Stock will be Sold and Registered in the Books of the Company *free of every expense* to Purchasers thereof.

Full particulars and Conditions of Sale may be obtained of the AUCTIONEERS, 49, Broad Street, BRISTOL; Messrs. BRITTAN, LIVETT, AND MILLER, Solicitors, Albion Chambers, BRISTOL; or of

JOHN PHILLIPS,
Secretary.

Chief Offices, Canon's Marsh, Bristol,

TO COAL MERCHANTS, SHIP OWNERS, AND OTHERS.

THE Directors of the Torquay Gas Com- pany are prepared to receive TENDERS for the supply of about 13,000 tons of best approved GAS COAL, to be delivered before the 1st of May, 1894.

Further Particulars and Forms of Tender to be obtained from Mr. Beynon, the Engineer of the Company, Hollacombe, Paignton; and tenders to be sent to the undersigned, on or before the 6th of May next.

The lowest tender not necessarily accepted; and the Directors reserve the right to accept part of any tender.

By order,
JOHN KITSON,
Secretary.

Torquay, April 20, 1893.

LIVERPOOL UNITED GASLIGHT COMPANY.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 120,000 tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months between the 1st of July, 1893, and the 30th of June, 1894.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom tenders, on the printed form, must be sent on or before Wednesday, the 17th of May, endorsed "Tender for Coal."

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street, Liverpool,
April 27, 1893.

HARTLEPOOL GAS AND WATER COMPANY.

TO IRONFOUNDERS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the supply and erection of RETORT-BENCH MOUNTINGS, COAL-HOPPERS, STOREAGE TANKS, &c., required for a Bed of Inclined Retorts.

Plans and Specification may be seen, or any further Information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the Plans.

Tenders, on form prescribed and sealed and endorsed "Tender for Retort-Bench Mountings," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 10th day of May next.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS TREWHITT,
Secretary.

West Hartlepool,
April 20, 1893.

Price 6s., Cloth Bound, Bevelled Boards.

THE

GUIDE-FRAMING OF GASHOLDERS

AND OTHER PAPERS

CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst.C.E.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NOTICE OF REMOVAL.

TO GAS ENGINEERS & MANAGERS.

CROWTHER BROS.,

Contractors for Retort Setting, Erection of Gas Apparatus, and General Repairs, have removed from 384, Mile End Road, to

152, TEVIOT ST., ST. LEONARD'S ROAD,

POPLAR, LONDON, E.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application

NIDDRIE CANNEL

A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

The Niddrie & Benhar Coal Co., Ltd.,

4, York Buildings, Queen Street,

EDINBURGH.

Telegrams: "BENHAR, Edinburgh."

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production over 3200 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over

400,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from

C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS

No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE,
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

NEW **BOX'S** PATENT

RETORT-LID FASTENER.

CANNOT GET OUT OF ORDER.
DOES NOT DAMAGE LIDS.
SIMPLE & EFFECTIVE.
CHEAP & DURABLE.

For Prices and Particulars, apply to

W. W. BOX,
GAS-WORKS, CRAYFORD, KENT.
[*Illustrated Description in* JOURNAL, *Vol. LX., p.* 346.]

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. PATTINSON, Public Analyst for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a working Analysis made of these Coals by the Falmouth Gas Company:—

[COPY.]
FALMOUTH GAS COMPANY,
Offices: *Church Street, Falmouth,*
January 25th, 1893.

Messrs. the

WEARDALE IRON & COAL COMPANY, LTD.,
NEWCASTLE-ON-TYNE.

GENTLEMEN,

From the Cargo of **THORNLEY GAS COAL,** received early this month from you, I have Carbonized at these Works, during a period of thirteen consecutive days, 151$\frac{15}{20}$ tons of the Coal, mixed with 9$\frac{6}{20}$ tons of Cannel Shale (or about 6 per cent.)

The Make of Gas during the above period was 1,624,000 cubic feet.

The whole of the Gas was made from four beds of sixes (24 mouthpieces); each charge being of six hours' duration.

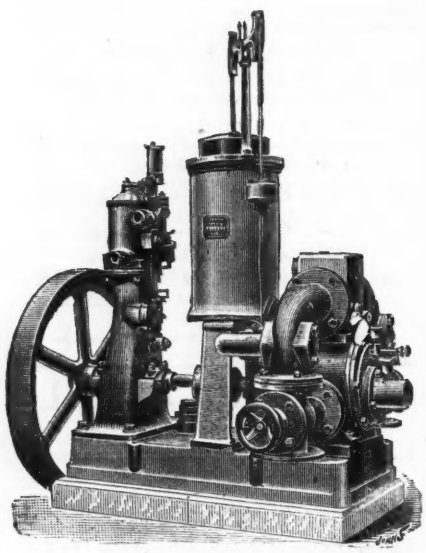
Gas made: 1,624,000 cubic feet.
Coal Carbonized: 151$\frac{15}{20}$ tons.
Cannel Shale: 9$\frac{6}{20}$ tons.
Make per ton of Coal and Cannel Carbonized: 10,082 cubic feet.
Coke per ton (of good quality): 13¼ cwt.

The ILLUMINATING POWER averages from 11 daily tests, **16·54 CANDLES,** which was ascertained by burning the Gas at the rate of 5 cubic feet per hour in a certified Letheby Photometer, fitted with a Standard Argand, each Candle consuming 120 grains of Sperm per hour.

Yours faithfully,
J. WM. BUCKLEY,
Engineer and Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.,
QUAYSIDE, NEWCASTLE-ON-TYNE.



WALLER'S PATENT COMBINED GAS ENGINE AND EXHAUSTER

WITH

Disc-Valves, Automatic Bye-Pass Valve, Throttle-Valve, and Regulator,

COMPLETE ON ONE BASE PLATE.

Designed chiefly for sizes from 500 to 15,000 feet per hour.
CAN BE SEEN IN ACTION AT ADDRESS BELOW.

EXHAUSTERS OF ANY SIZE
COMBINED WITH GAS-ENGINES (now made to vary in speed).

ENGINES & EXHAUSTERS RUN AT DIFFERENT SPEEDS.
Waller's Washer-Scrubber with Wood Clusters.
ELEVATING AND CONVEYING MACHINERY FOR COAL, COKE, &c.

G. WALLER & CO.,

58, PARK STREET, SOUTHWARK (SURREY SIDE OF SOUTHWARK BRIDGE.)

TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,

(*Established 1851,*)

Tar Distiller and Manufacturing Chemist,

WOLVERHAMPTON.

SCULCOATS, HULL.

To effect a great saving in

GAS-FURNACES use our Special Derbyshire GANNISTER BRICKS.

ADDRESS

JAMES WHITE & Co., Limited,

ALBERT WORKS, WIDNES.

NEWBATTLE CANNEL.

Highe t Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

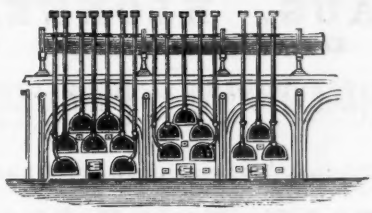
PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

DEMPSTERS'



RETORT-SETTINGS,

RETORT-FITTINGS,

ELLAND.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

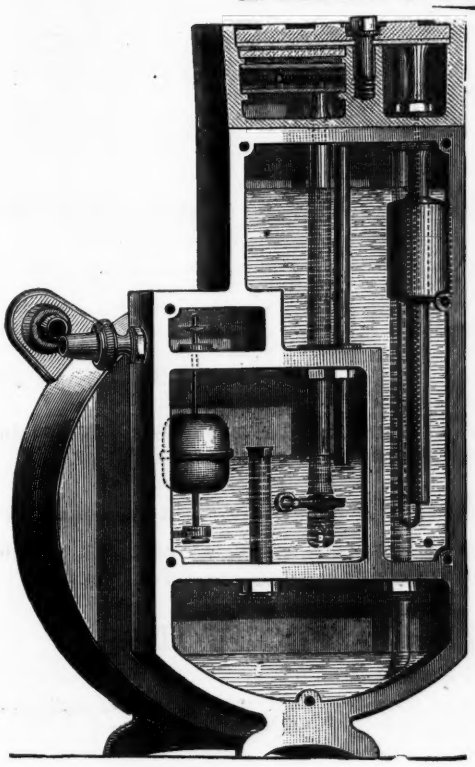
Telegrams: "ATLAS SHEFFIELD."

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT

UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required, and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s., and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

AUG. KLÖNNE,

DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in

Efficiency, Economy, Durability, and Easy Working.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

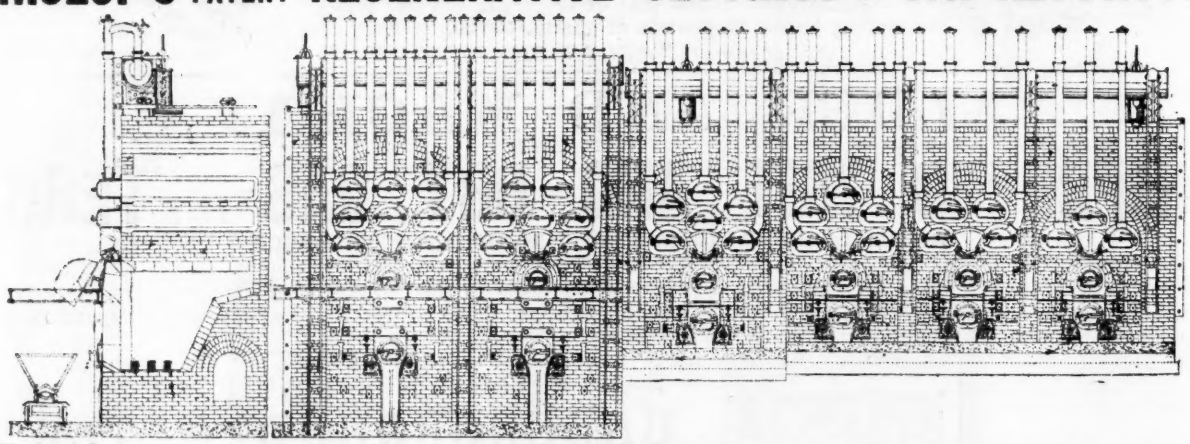
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACK ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S PATENTS.

All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

Descriptive Pamphlets and Terms from Agents as above.

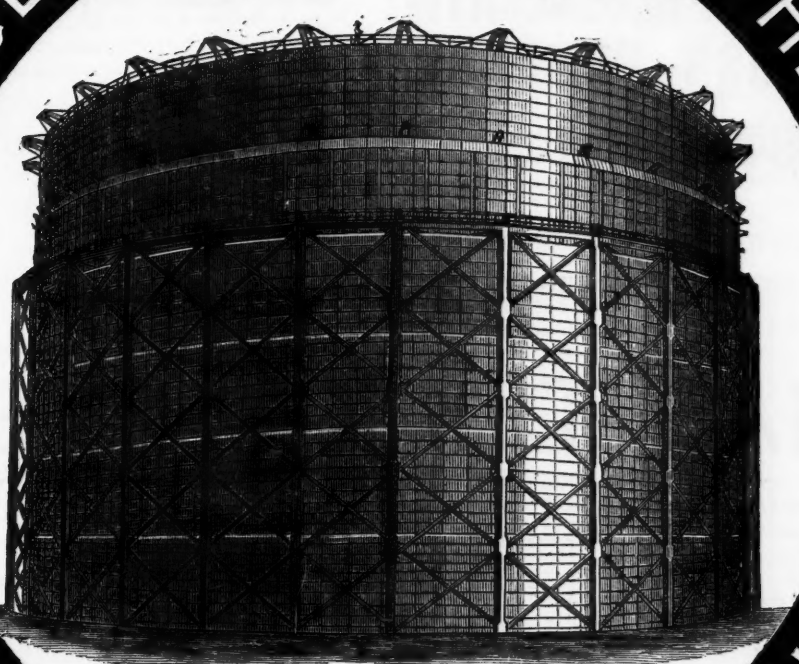
GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

G. J. EVESON,
GAS COAL AND CANNEL CONTRACTOR,
MANUFACTURER OF
A Special Compound for the cure of Stopped Ascension-Pipes. A couple of charges will clear a stopped Pipe, and an occasional charge keeps them clean; also increases the Make per ton and the Illuminating Power.
Prices and Particulars on Application. HEAD OFFICES: CORPORATION STREET, BIRMINGHAM. TELEGRAPHIC ADDRESS: "EVESON, BIRMINGHAM."

THE WATERBLEAN COLOR AND MINING COMPANY, MILLOM, CUMBERLAND.
TELEGRAPHIC ADDRESS: "WATERBLEAN MINES, MILLOM." PORTERAGE, 1s. 6d.
VENETIAN AND OXIDE REDS for the Manufacture of ANTI-CORROSIVE PAINTS.
Specially adapted for the Ironwork of Gas-Works and wherever subject to exposure.
G. J. EVESON, Proprietor, Corporation Street, Birmingham.
ORDERS TO BIRMINGHAM, OR DIRECT TO THE MINES.

CLAYTON SON & Co, LTD
MAKERS OF
WORKS LEEDS
THE LARGEST GASHOLDER IN THE WORLD.
GASHOLDERS OUR SPECIALITY



CAPACITY 12 MILLION CUBIC FT.
ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR
MAKERS OF GAS PLANT OF EVERY DESCRIPTION
ROOFS PURIFIERS &c. ALSO
ADDRESS LONDON 60, QUEEN VICTORIA ST.
TELEGRAPHIC "GAS, LEEDS."
GASHOLDERS OF ANY SIZE
ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E..
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES
AND
CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,
CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
OXO	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, ST. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—
BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

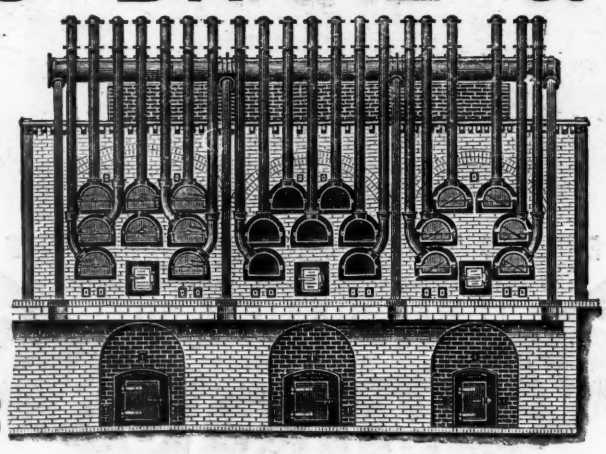
JONAS DRAKE & SON,

TELEGRAPHIC ADDRESSES:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON"

TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
DRAWINGS, SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

OVENDEN, HALIFAX.

CARLESS, CAPEL, & LEONARD,

HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,

NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS

Specially prepare **GASOLINE**, specific gravity ·650; **CARBURINE**, specific gravity ·680; or any other Hydrocarbon best adapted for Carburetting Gas.

Prices and Samples may be had upon application.

THE "METEOR" HIGH-POWER GAS-LAMP.

CLASS B.

The Electric Light's greatest Rival. Has been awarded 8 Gold and Silver Medals.

For inside, and outdoor Lighting.

THE "METEOR" LAMP IS

The cheapest
The simplest
The most economic
The most durable
The most brilliant
The best ventilating
The most easily cleaned

} **Lamp in Existence.**

The best and most suitable Lamp for hiring and hire-purchase. Being made entirely of fine Cast-Iron, the "Meteor" is practically indestructible. Greatly reduced prices. Liberal terms. Write for new descriptive reduced price list.

N.B.—Accessories are now offered at greatly reduced prices.

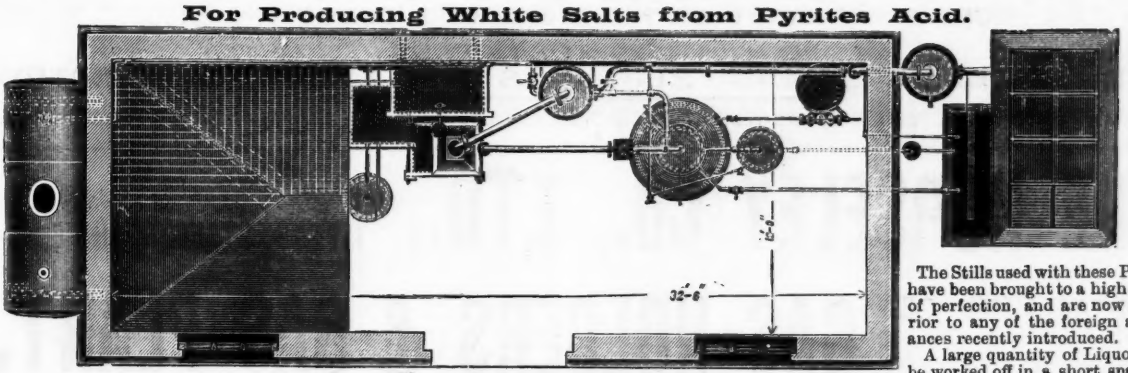
W. J. MOORE,

Sole Manufacturer's Representative,

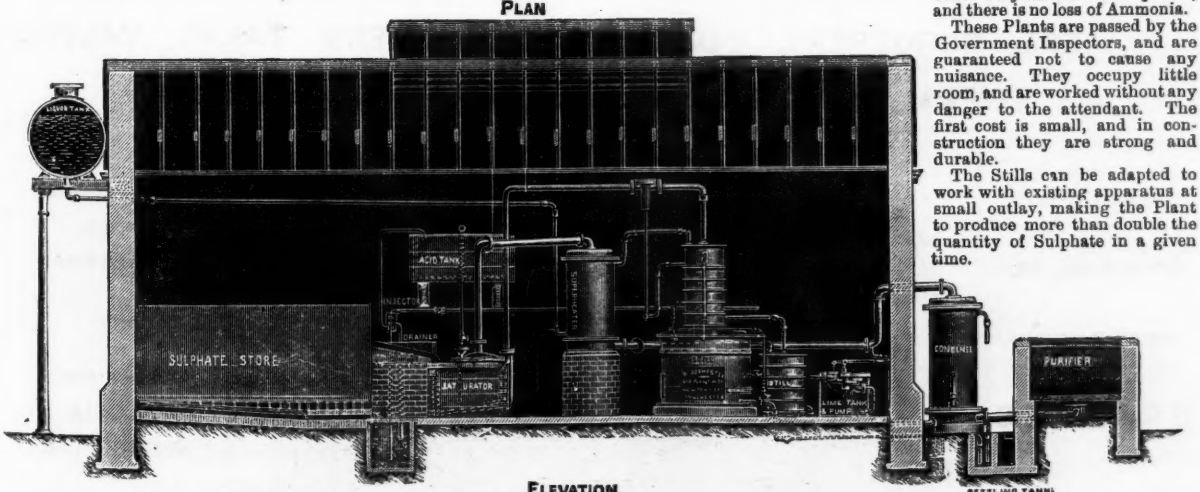
83, UPPER THAMES STREET, LONDON, E.C.

SULPHATE OF AMMONIA PLANTS

For Producing White Salts from Pyrites Acid.



PLAN



ELEVATION

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

A large quantity of Liquor can be worked off in a short space of time. Very little Fuel is required; and there is no loss of Ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

The Stills can be adapted to work with existing apparatus at small outlay, making the Plant to produce more than double the quantity of Sulphate in a given time.

FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS,

R. & J. DEMPSTER,

ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

(FRANK W. CLARK, Engineer and Manager)

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON.

RETORT WORK

HORIZONTAL, INCLINED, REGENERATIVE, GENERATIVE, OR FLOOR-LEVEL SETTINGS.

J. & H. ROBUS,

ENGINEERS AND CONTRACTORS,

MANSION HOUSE CHAMBERS, 20, BUCKLERSBURY, LONDON, E.C.

ARE PREPARED TO ENTER CONTRACTS

FOR EXTENSIONS OR RENEWALS OF THE ABOVE WORK DURING THE ENSUING SEASON.

PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED

FOR EXTENSIONS AND RENEWALS OF EVERY DESCRIPTION.

Contractors for the Erection of Gas-Works complete, including Gasholder Tanks of all sizes and Main Laying.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

IERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES

PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

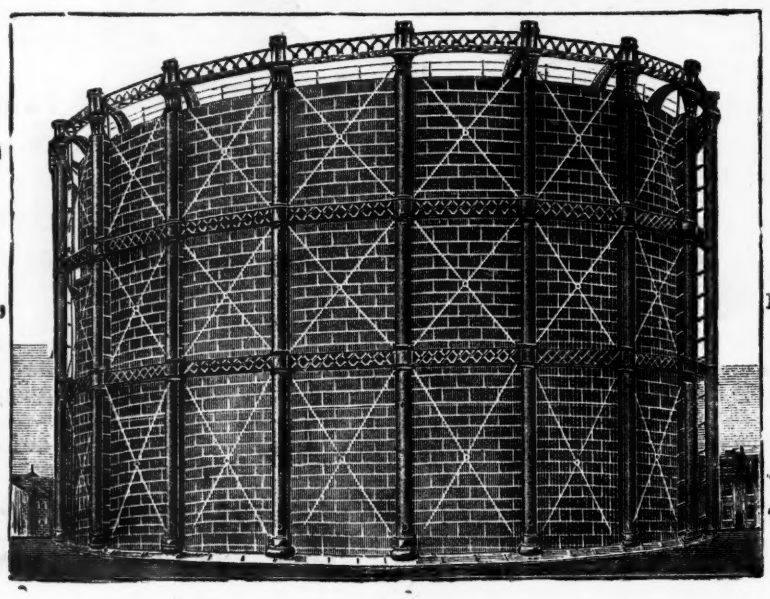
STRUCTURAL IRON

AND STEEL WORK,

BRIDGES,

ROOFS,

PIERS, ETC.



WORKS & HEAD OFFICE:

TIPTON,

STAFFORDSHIRE.

LONDON OFFICE:

11, VICTORIA ST.,

WESTMINSTER.

TELEGRAPHIC ADDRESSES:

"HORSELEY, TIPTON."

"GALILEO, LONDON."

HYDRATED OXIDE OF IRON
FOR GAS PURIFICATION.

Two to three times as rich in Hydrate as Bog Ore.
STRONG ACTION ON SULPHURETTED HYDROGEN.
We have for sale Hydrate of Iron containing 77 per cent. of Ferric Oxide and 17 per cent. of Water. Directions given for mixing for Purifiers.
LESS THAN HALF THE PRICE OF BOG ORE.

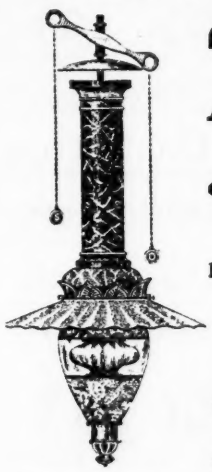
APPLY TO—
READ HOLLIDAY & SONS, LTD., HUDDERSFIELD.

SOOTHILL WOOD CANNEL.

Yield of Gas per ton, over 12,000 cubic feet.
Illuminating Power - - - 26 candles.
Coke per ton - - - - - - 57 per cent.
Of a quality almost equal to that made from the best Coking Coal.

For Analysis and Price, apply to
THE SOOTHILL WOOD COLLIERY Co., LD.,
SOOTHILL WOOD COLLIERY,
BATLEY, YORKSHIRE.

The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England by
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

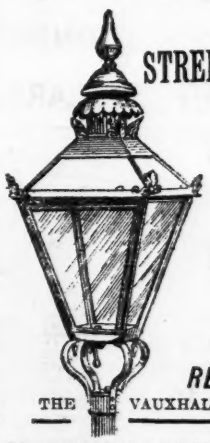
Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.
RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

HARPER & MOORES,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1838.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

"TELEGRAPHIC ADDRESS, "GAS LEEDS."
CLAYTON, SON, & Co.
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.
"LONDON OFFICE," 60, QUEEN VICTORIA STREET, E.C.
PRICES ON APPLICATION.

S. PONTIFEX & CO.,
GAS & WATER ENGINEERS,
22, COLEMAN ST., LONDON, E.C.
Manufacturers of
STREET LAMPS for HOME & EXPORT.



ALL REQUISITES FOR STREET LIGHTING.
HIGH-POWER LANTERNS FOR REFUGES & OPEN SPACES.
IMPROVED STREET-LAMP REGULATORS AND LAMP TAPS.
THE VAUXHALL.
FLAT-FLAME GOVERNOR BURNERS,
Suitable for FACTORIES, OFFICES, and all Open Lights,
at 15s. per dozen.
PATENT LAMPLIGHTERS' TORCHES.
COLUMNS for GAS or ELECTRIC LIGHTING.
Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

THE "PARKINSON"

GOLD MEDAL

GAS COOKER.

SPECIAL FEATURES.

May now be had with either Cast or Wrought Iron Enamelled Linings, very easily cleaned, and practically indestructible. The "Parkinson" Cooker is now fitted with the registered Cast-Iron Hinged Gate—an invaluable contrivance for ensuring a clean, well-ventilated Oven.

WHAT GAS ENGINEERS SAY:—

"I have no sort of hesitation in testifying to the excellence and effectiveness of the Gas Cookers. Give no trouble, bake admirably, and cook to perfection."

JOHN L. COCKER, *Merthyr Tydvil Gas Company.*

"They are giving our customers universal satisfaction."

B. W. SMITH, *Smethwick Gas-Works.*

WHAT COOKERY TEACHERS SAY:—

"The teachers express themselves as thoroughly pleased with them, and have put them to very considerable tests."

R. P. WARD, *Cheshire County Council.*

"During last winter we used them at all the centres where we cooked by gas; and we shall continue to do so until we find they are superseded, which I consider unlikely."

MATILDA LEES DODS, Principal,
Birmingham and Midland School of Cookery.

"It is easy to manage, very good in its results, and most economical in the consumption of gas. Pastry, bread, cakes, and meat are all equally well cooked and beautifully browned in the oven. The grilling, boiling, and simmering arrangements are perfect."

I am, Gentlemen, yours faithfully,
(Signed) SOPHIE THWAITES, *International School of Cookery, Liverpool.*

Adopted by many LONDON AND PROVINCIAL GAS COMPANIES.

COTTAGE LANE WORKS, CITY ROAD,	BELL BARN ROAD WORKS,	10, MAWSON'S CHAMBERS, DEANSGATE,
LONDON.	**BIRMINGHAM.**	**MANCHESTER.**
Telegraphic Address: "INDEX."	Telegraphic Address: "GAS-METERS."	Telegraphic Address: "PRECISION."

(See also Advt., p. 766.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, May 2, 1893.